

THE MODEL ENGINEER



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The MODEL ENGINEER

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SMOKE RINGS

Our Cover Picture

● ONE OF the most intriguing exhibits in this year's "M.E." Exhibition will be the little piano which forms the subject of our cover picture this week. We have occasionally had model pianos in past exhibitions, but none of them has been quite like this one; in fact, we believe this latest one to be unique.

It is the work of Mr. H. A. J. Smith, of Bexley Heath, Kent, and is a fully working, iron-frame, trichord, underdamper, check action piano with the full 85-note keyboard, made to the scale of 4 in. to the foot. We understand that it is tuned to sound one octave above a full-size piano. We are sure that many visitors will wish to inspect this very much-out-of-the-ordinary piece of work, though we are rather doubtful if any of them will be possessed of one-third full-size fingers to enable them to play it!

The only purchased materials used in the construction were: wood, wire, felt and screws; some 1,700 hours spread over five years were spent in making this most interesting model.

Very Nearly There

● NEXT MONDAY is the day for which large numbers of our readers have long been waiting, and the wait has, of course, been longer this year than in the last few years; but it has given everybody concerned in the preparations, time in which to make sure that the 1952 "M.E." Exhibition shall be one to be remembered for many years to come.

The doors will open to the public at noon on Monday, but at 11 a.m. each day afterwards (except Sunday) until Wednesday the 29th, for

the show will run for only nine days this year instead of the usual ten.

Private and ecommmercial exhibits seem to have responded splendidly to this auspicious occasion, and in every section of the show there will be something outstanding to be seen. The maritime section looks like being an exhibition in itself, and is by far the strongest of them all, numerically, at anyrate, judging by the number of entry forms sent in. But in all sections there will be plenty of new work to be seen, most of it, as already indicated, of excellent quality.

A welcome revival is the passenger-carrying track which will be back in its usual place along one side of the hall, manned by the stalwart track committee of the S.M.E.E.; a large stud of locomotives will be taking turns in running the traffic on 3½-in. and 5-in. gauges, and there may be one or two 2½-in. gauge engines in steam, periodically, during the run of the exhibition.

Radio-control will be well to the fore, because this particular method of operating models has made great progress during recent years and is now firmly established, not only for boats and aircraft, but for other things as well.

We would like to urge visitors not to pass by the railway miniatures; we know that these little things do not appeal to many model engineers, but we think that some, at least, of those to be exhibited this year contain some first-class work, especially in 4-mm. scale, and will well repay close inspection. Their builders are now showing that they can rival the ship miniaturists—and that is saying a great deal!

We think that few, if any, visitors to this year's "M.E." Exhibition will go away disappointed.

Hull Design

● AT THIS year's "M.E." Exhibition we have arranged for Mr. C. C. Chapman to demonstrate by means of diagrams and models, the principles of hull design. He will be found at the demonstration stand on the dais. This will be a great help to builders of working models, both power and sail, and we trust our visitors will not hesitate to bring along their problems.

Marine Clubs at the "M.E." Exhibition

● THE MODEL Yachting Association, The Model Power Boat Association, the International Radio Controlled Models Society, and the Ship Model Societies have been allotted stands, and a special effort has been made this year to make them as attractive and useful as possible.

An Exhibition Personality

● FOR SEVERAL years now, the demonstration of wood turning given by Mr. F. Pain, of High Wycombe, has been one of the most popular features of the "M.E." Exhibition. He is not only a master of his craft, but also has the gift of infecting his audience with something of his own enthusiasm; many who have witnessed the magic of this "wizard in wood" have been inspired to install a lathe and try their hand at this fascinating craft. Mr. Pain informs us that he will be assisted this year by a very youthful but competent "apprentice," who will show how easy it is to carry out many operations which appear formidable, including the boring of holes of any length; he has, in fact, succeeded in boring the full length of a broomstick blindfolded, and also put five holes through a piece of wood $1\frac{1}{4}$ in. square by 40 in. long. As in previous years, free lessons in wood turning will be given to visitors, who can purchase pieces of wood, machine them on the spot, and take home the finished product. We have had many testimonials to Mr. Pain's helpfulness, not only at the Exhibition, but at any time; readers who ask for his advice and guidance, or seek to obtain suitable timber for turning or other light work, rarely go away disappointed.

Mr. Pain informs us that a few of his customers have made complaints regarding charges for carriage on consignments of timber, and has asked us to explain that this is a matter outside his control. In view of the fact that the timber must be specially selected, often entailing a good deal of time and trouble in doing so, we are satisfied that the charges are not unreasonable. According to the information on a card issued by Mr. Pain, his business is described as "Turners and Twisters to the Trade—the Oldest Twisters in the Business"—but we do not think those who have had dealings with him will apply the colloquial interpretation of the term to this description!

Exhibition at Chatham

● THE RECENT exhibition put on in the Town Hall, Chatham, by the Medway Society of Model and Experimental Engineers was, we are glad to learn, a satisfying success. It was an excellent and well varied show, and had obviously been planned in such a way that, not only model engineers but also the general public had plenty

to admire and inspect with interest. A collection of model steam engines of several different kinds were shown working on air, and there was more than one working model railway. The scope had been widened to include most of the arts and crafts, covering woodwork, photography, painting, embroidery and weaving, and some beautiful work was to be seen in all sections.

Something of a novelty, and a very striking one, was provided as a cine show; it was in a large darkened room off the main hall, and consisted of a miniature proscenium complete with full lighting effects, rising and falling organ console with a miniature organist about $3\frac{1}{2}$ in. high, who bowed his acknowledgments to the audience before and after his performance at the organ. The whole lot of this was remote-controlled, producing an amusing and highly interesting effect. The programme was a selection of films projected by an orthodox sub-standard projector on to the miniature screen behind the proscenium curtains.

Some indication of the high standard of the exhibits generally was evident in the large number of certificates of merit awarded in addition to the usual cups and medals. On the final day, Mr. J. N. Maskelyne attended in order to present the prizes to each of the lucky winners.

Mr. H. L. Hall

● WE WERE very sorry to learn of the recent death of Mr. H. L. Hall, M.B.E., A.M.I.Mech.E., M.Inst.T., of Birmingham. An engineer of considerable experience and ability, he became works manager of the Royal Aircraft Factory, Farnborough, in 1912. Later, at the formation of Imperial Airways Limited, he was appointed chief engineer. Tributes to him show that he did much to make possible the production of aircraft and engines which helped to win the 1914-18 war, and that as a pioneer of aeronautical engineering, credit for much of today's perfection in aircraft and engines is due to him.

We had the pleasure of meeting him and his son, Mr. H. Reeves Hall, at "M.E." Exhibitions, and learnt that he had been a reader of THE MODEL ENGINEER since the first issue. He retired from business in 1939 and spent much time in his workshop making many fine tools. Perhaps the best of these is a 3-in. centre lathe which he designed when 70 years of age, subsequently making all the patterns and castings which he then machined on his $3\frac{1}{2}$ -in. Drummond lathe; it was finished shortly before his death and is now proudly possessed by his elder grandson.

Mr. H. R. Hall tells us that his father has left many pages of THE MODEL ENGINEER, which he had extracted as useful for future reference, many of them being the writings of "L.B.S.C." and Edgar T. Westbury. Mr. Hall, Jr., adds:—"I felt that my father would have liked me to write to you, for he got much enjoyment from the pages of your journal, which, fortunately, I still do, having been a subscriber for many years."

In offering our sincere sympathy to the bereaved family, we feel a sense of personal loss in the passing of, not only such an able engineer, but also of so enthusiastic a supporter for so many years.

WHAT TO SEE

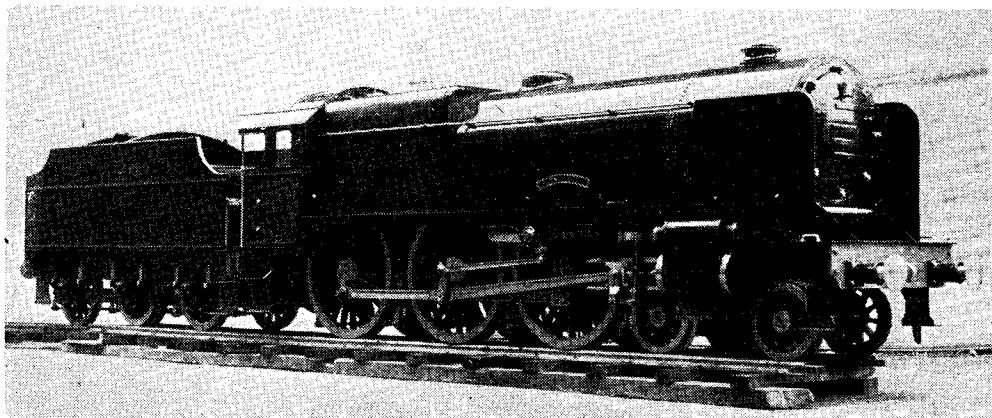
AT THE "MODEL ENGINEER" EXHIBITION

THE COMPETITION MODELS

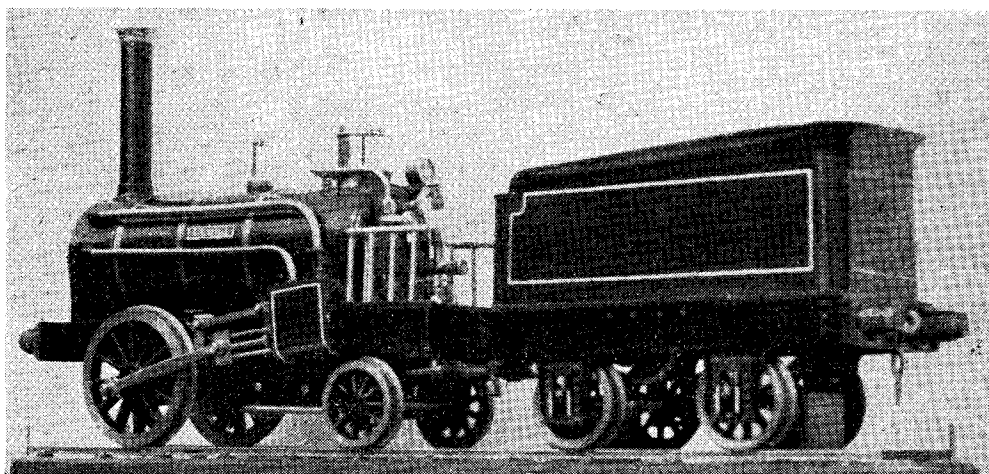
JUDGING from a preliminary look through photographs and particulars sent in by prospective competitors, there is some nice work to be found among the locomotives in the Competition section this year. Perhaps, the most impressive of the locomotive models is the 10½-in. gauge *Royal Scot*, which weighs close upon 1 ton! It is complete with all essential details and controls, of course, and appears

to be soundly constructed and very well finished. It comes from Ilkeston, Derbyshire, and is the clearest evidence that its builder is not only thoroughly familiar with, but also an admirer of the famous prototype.

By sharp contrast, there is a 3½-in. gauge *Rainhill* built by a Middlesbrough joiner. We understand that this little engine, in spite of its single driving-wheels and very light weight,



A 10½-in. gauge L.M.S.R. "Royal Scot"



A neat first attempt by a novice

has hauled a load of 300 lb. round a 660-ft. continuous track ; so there is not much the matter with her !

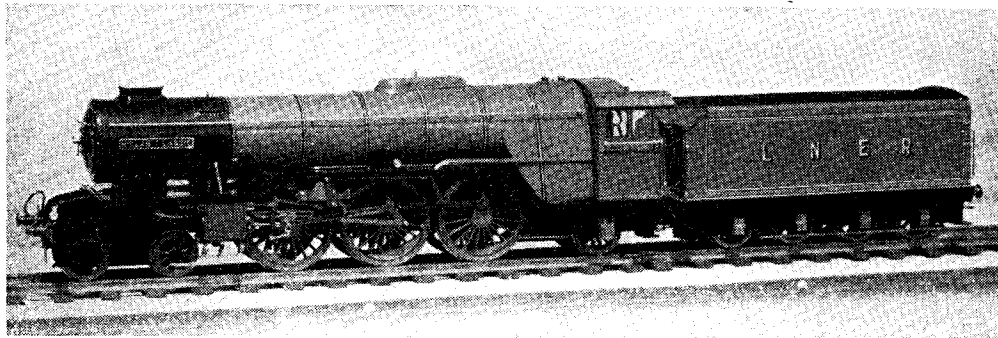
From the "Words and Music"

A *Hielan' Lassie*, 3½-in. gauge 4-6-2 engine from Coventry appears to be a very nice piece of work. Its main feature is Baker valve-gear operating piston-valves, and the general finish seems to be very satisfactory.

named *Ada-Margaret*, and it is reputed to be an excellent performer. There is much to be said in favour of an engine of this type, in certain circumstances, especially when it is well built, as this one appears to be.

A First Effort

An example of the inevitable "first attempt" is a 3½-in. gauge 4-6-0 engine based on the L.M.S. Class "5" mixed-traffic locomotives.

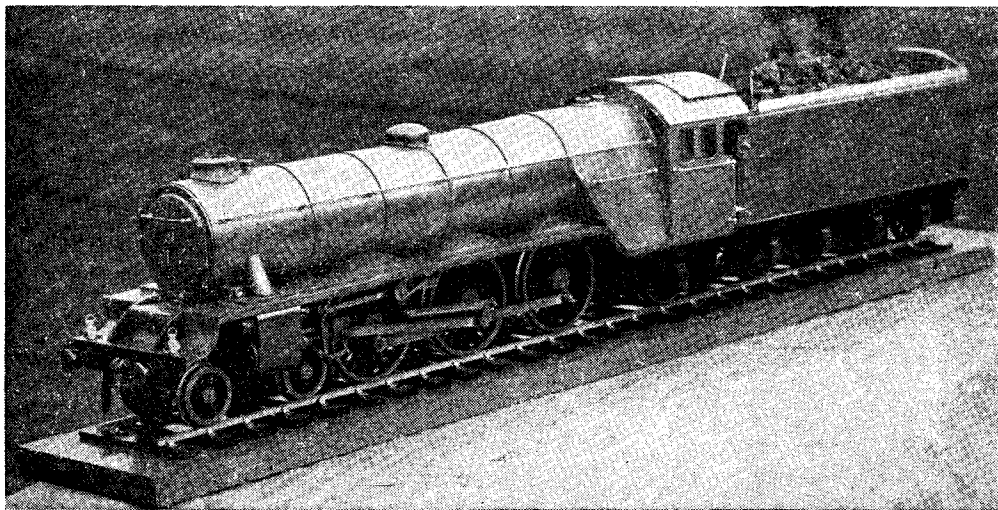


A "*Hielan' Lassie*," 3½-in. gauge, with Baker valve-gear and piston-valves

We believe it is some time since there was an *Olympiade* in the "M.E." Exhibition, but this year there is a very nice one. This is a 2½-in. gauge 4-6-0 based on the L.M.S. "Jubilee" class, and the particular example exhibited bears the significant name *Purleycurly*, a little tribute that can scarcely fail to be appreciated in the proper quarter !

A 5-in. gauge 2-6-4 type "*Halton*" tank locomotive is another impressive job ; it is

We understand that, in order to be able to build this engine, its builder *made his own lathe* ! This has 5 in. centres and is suitable for screw cutting with self-action ; it was fabricated from scrap metal and welded together. No doubt the experience gained from this operation came in useful during the construction of the locomotive, which, incidentally, was built to the well-known *Doris* design of "L.B.S.C."

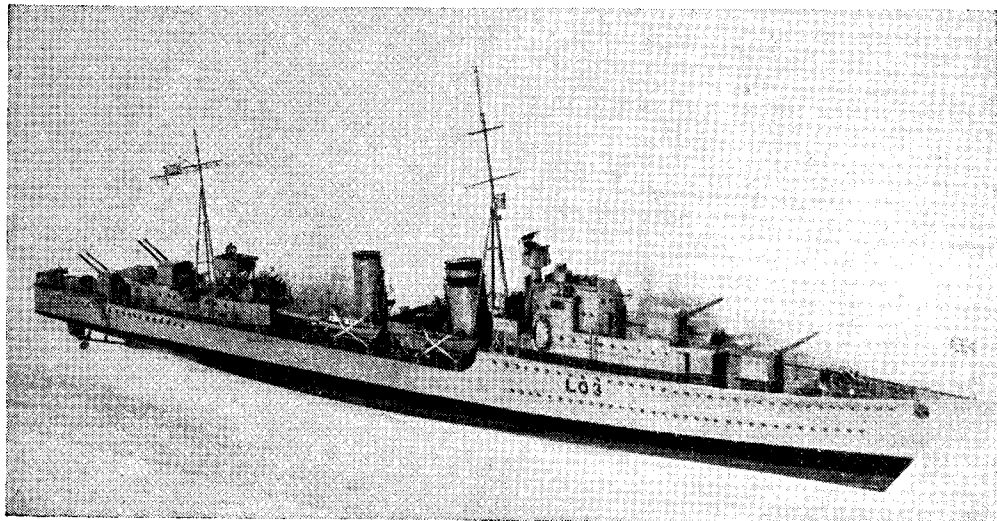


A 2½-in. gauge, coal-fired L.N.E.R. Pacific locomotive

Marine Models

It is a continual sense of wonder to the organisers that year after year fresh models appear at the annual "M.E." Exhibition, and that quite an appreciable proportion of them come from people of whose existence we were previously unaware. Their number, quality and variety proves conclusively how alive is the interest in modelling and in craftsmanship. The number of ship entries this year is well up to standard and the maritime section still keeps its position as being the largest in the exhibition. In this

experience it will be first-class. This year he is joined by his wife, who has sent in a scenic model of the *Flying Enterprise*. She acknowledges freely the helpful advice received from her husband, but the model is definitely her own work. We look forward to seeing it. Mr. Yates of Nottingham, is exhibiting a waterline model of the R.M.M.V. *Hibernia*, and remembering his previous models of this type, this should be good. The cabin cruiser by Bernard Reeve has an interesting instrument panel, all the dials being made from large drawings reduced to



Mr. H. Macklin's model of the destroyer "Cossack"

section the sailing ship is as usual the most popular, probably because many people still consider the sailing ship as one of the most beautiful things ever made by a man.

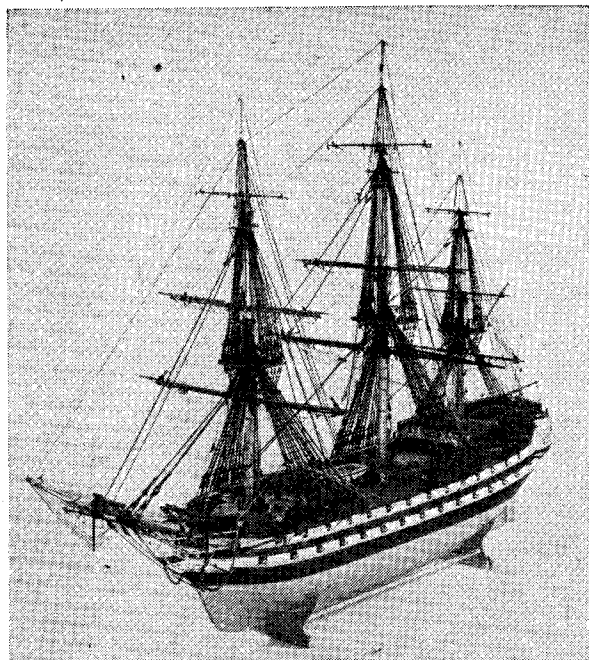
In describing what to see at the Exhibition, it will be understood that the models mentioned are those which have some special feature, or whose quality we can reasonably anticipate from knowledge of the entrant's previous models or from photographs, and is no indication of the position they may occupy in the prize list when they have been judged.

Considering now the actual models, and taking the classes in the order in which they are arranged in the catalogue, we come first to Class "D," Non-Working models of Steamers and Power Driven Vessels. The destroyer model *Cossack* by H. Macklin of Dovercourt, is a very impressive example of ship modelling, as will be seen from the photograph we reproduce. The waterline models of the liners *Himalaya*, *Caronia* and *Ruahine* by P. T. White of Strood form a noteworthy series. There is, of course, a model of the new holder of the Blue Riband, the U.S.S. *United States*, this one by A. R. Addey of Tunbridge Wells. We have often admired the work of E. N. Taylor of Gosport and while we have not seen his model of the *Caledonia Coast* at the time of writing, we know from past

correct scale diameter by means of photography. This method was suggested in an article in our companion magazine, *Model Ships and Power Boats*, for March, 1952.

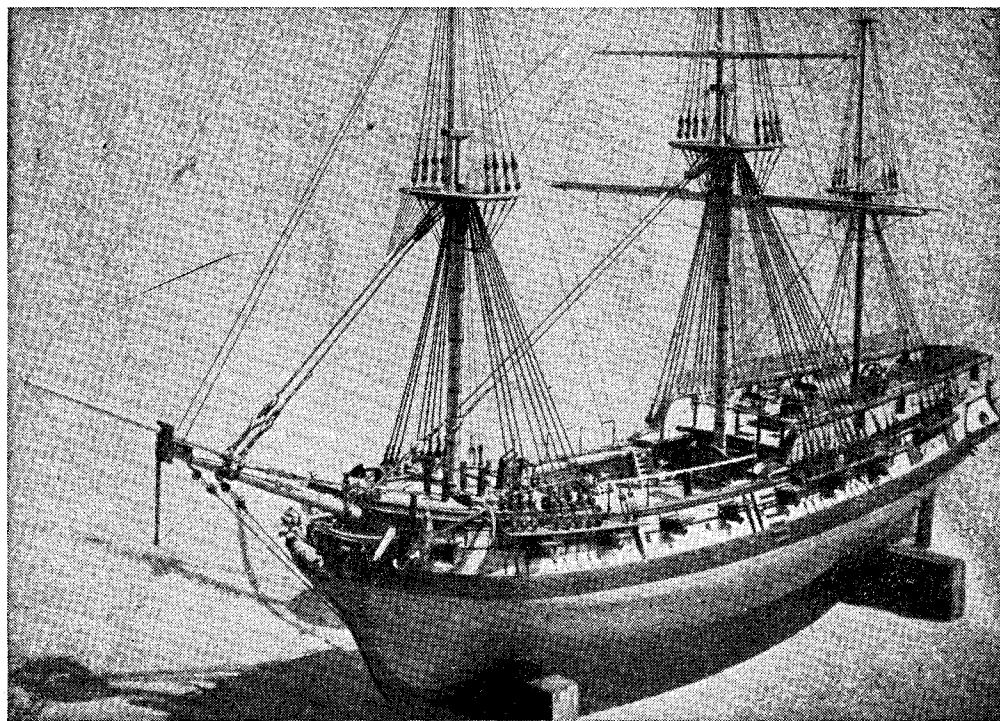
Section "E" consists of working Model Steamers and Power Driven Vessels, and includes, as usual, a large number of cabin cruisers, two at least being radio controlled. There is also a model of the anchor liner *Circassia* by B. A. Wales of York, and two destroyers, one of H.M.S. *Diana* by F. G. Nutt of Oxford, radio controlled with a metal hull, in which, although the details are kept simple, the general effect is very good, and the other of H.M.S. *Hunter* by R. H. Arknett of London, S.W.1., which was built to show what can be made from inexpensive materials, and which has a very realistic appearance. The battle cruiser *Hood* by J. W. Howard of Greenford, Middlesex, is a very fine model and great attention seems to have been given to the armament and the deck details. The model, as a whole, has nice proportions and should look well on the water. There is an interesting model of a stern wheeler, by C. J. Rattray of Highbury, N.5. This type of craft does not appear to attract the attention it deserves and we are pleased to see this example.

Coming to the sailing ship models, Class "F," the earliest type represented is the Roman cargo



A model of an interesting ship—H.M.S. "Implacable," by Lieut. Cdr. T. F. Richards

ship of the second century, by J. A. Pomeroy, of Gerrard's Cross. The Elizabethan period is represented by a $\frac{1}{4}$ -in. scale galleon, sent in by J. E. Bowles, of London, and a Spanish galleon made jointly by Dr. and Mrs. E. O. Watson, of South Ruislip, Middlesex. The galleon, as the subject for a model, appears to be taken more seriously now than used to be the case. Perhaps ship modellers are beginning to see the faults of the typical galleon models of a few years ago. In any case, there is less excuse nowadays in view of the many excellent plans and books on the subject which are available. There is, of course, the usual *Victory* model; two this year, one from Norwich, and one from Bristol, and both reasonably accurate and well detailed. Then we have a *Cutty Sark*, this time in Perspex, entered by R. A. W. Ray, of Workshop, Notts. There are two *Endeavour Barks*, one by Engineer Lieut.-Cdr. Langdon, of Plymouth, which has lots of interesting detail, including a crew, and the other by C. I. Clarke, of West Bromwich. This latter model is one of the Birmingham club team entries, which, with its two team mates, H.M. Sloop *Echo*, by F. A. Pariser, and the Severn Trow *Alma* by A. E. Field, puts the club in its usual strong position as regards the club



Mr. Pariser's fine model of the sloop "Echo"

team prize. The wonder is that this club can produce for each Exhibition new models of such very high standard, and that the models are usually by the same people. To make a model of this standard in a year is a terrific task, and one imagines that the garden or the usual jobs about the house must to some extent be neglected. Perhaps they are carefree batchelors—although we know in certain cases they are not.

From photographs we have seen of the sloop *Echo*, one of which we reproduce herewith, we consider it an extremely fine model. Mr. Pariser's work seems to improve every year. Mr. Field's work in the hull of his Trow is quite up to this builder's cup-winning standard, and we look forward to seeing the completed model. The model of H.M.S. *Implacable*, by Engineer Lieut.-Cdr. T. F. Richards, of Harrow, Middlesex is a lovely piece of work, as will be realised from the photograph herewith. It is surprising that this is the only model we have seen so far of this important and interesting ship, especially as for many years she was to be seen, first at Falmouth and then at Portsmouth. She was a typical 74-gun ship of the period, and being the only two-decker was that much easier to build than a three-decker, such as the *Victory*. Probably the fact that she was French-built put some people off modelling her.

Model Cars

Some interesting examples of both working and non-working cars appear in this year's Exhibition, including a number of racing models, mostly in the smaller classes.

These include a 2.5 c.c. diesel engined racing car by Mr. F. Shilton, of Glasgow, built to his own design, including engine and centrifugal clutch.

Another racing model is entered by Mr. C. R. Callcut, of Slough, in this case being a model of the B.R.M., fitted with a proprietary 2½ c.c. engine.

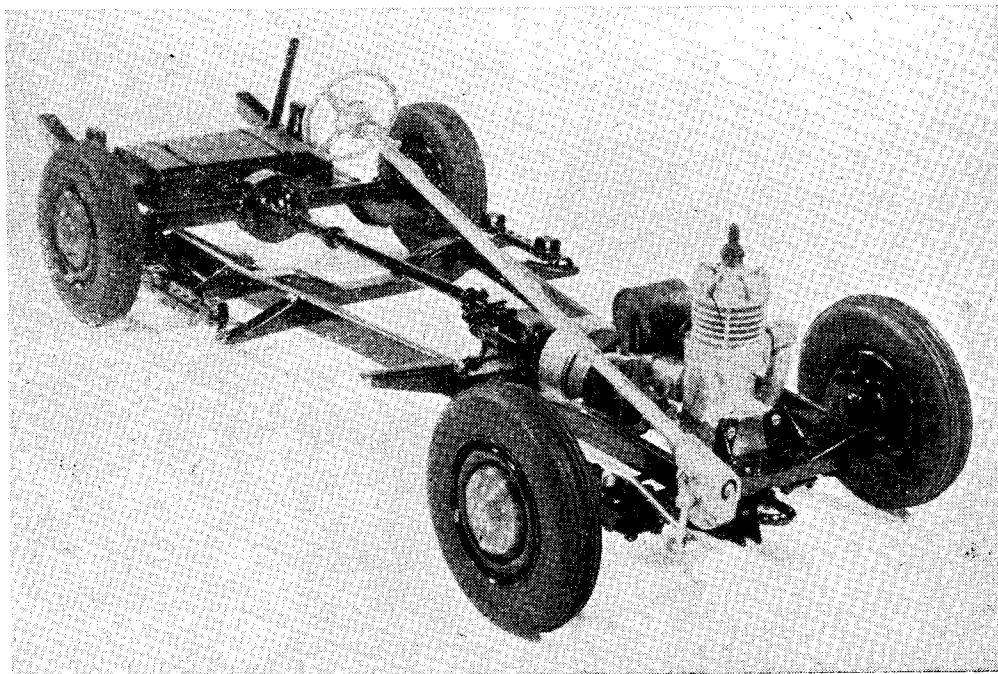
The 1/12th scale model Jaguar XK120, by Mr. H. F. Mayo, of Amersham, is fitted with Elfin diesel engine, capacity not stated.

Mr. W. W. Shannon, of Pinner, has entered a 1/5th scale model of the Meyer-Drake Offen-hauser car, the information about which was obtained from the M.G.M. film "To Please a Lady," and which won first place in a competition organised by the film company. This car is fitted with a Mills diesel engine and Juneero wheels.

The free-lance sports car by Mr. K. B. Rawlinson, of Mottingham, S.E.9, is based on the Frazer-Nash "Mille Miglia" model and is built from a modified commercial model car kit and a commercial engine.

A 1/6th scale Sunbeam Talbot car is entered by Mr. L. S. Jones, of Fulham, S.W.6.

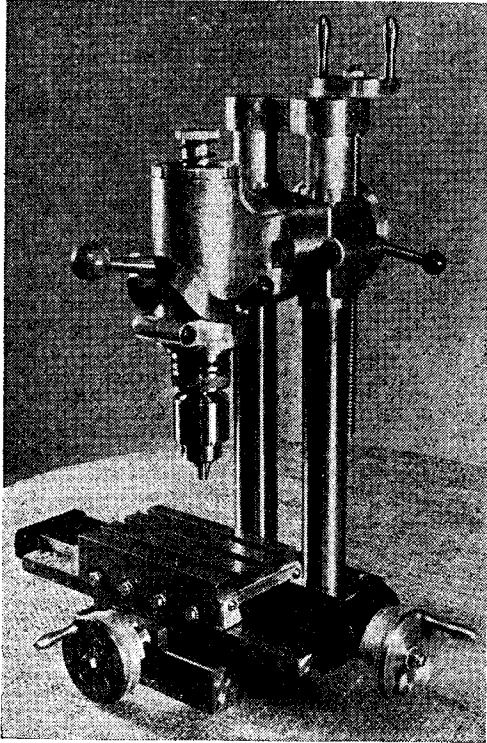
Non-working cars include a free-lance saloon touring car by Mr. L. W. Harrison, of Fulham, S.W.6, built to a scale of 2 1/8 in. to 1 ft. and a Bentley 4½-litre supercharged car by Mr. D. Chelley, of Willesden, N.W.6, a 1/6th scale model "P" type M.G. car by Mr. F. H. Buckley, of Ashford, Middx., a 1/12th scale electric delivery van by Mr. A. Hale, of West Kensington, W.14, and a 1938 Grand Prix Mercedes by Mr. W. R. Finch, of Potters Bar, Middx.



The chassis of Mr. L. S. Jones's Sunbeam-Talbot

Tools and Workshop Appliances

The exhibits in this section are not only more numerous than in most previous years, but are also well varied, and in nearly all cases of an interesting character. Construction of small lathes, embodying individual or original features, is as popular as ever, and exhibits of this type include a 2½-in. precision lathe fitted with a division plate and filing rest, by Mr. S. R. Harris, of Morden, a 1½-in. back-gear screwcutting lathe by Mr. H. M. Hayes, of Worthing, and a miniature lathe with universal chuck by Mr. D. Kidd, of Gloucester.



Mr. G. D. Reynolds's combined jig borer and vertical milling machine

A rather unusual collective exhibit, entered by the Redditch and District Model Engineering Society, is a set of ten drilling machines, constructed by club members, some of them making their first attempt at machining, under the tuition of more experienced members. A miniature motorised precision drilling machine, of fabricated structure, taking drills up to ¼ in. diameter, is entered by Mr. G. T. East, of Tolworth.

Several examples of the universal dividing head designed by Mr. A. R. Turpin and described in *THE MODEL ENGINEER* early this year, make their appearance at the Exhibition. These include one by Mr. W. D. Urwick, of Taplow, as an attachment for the ingenious lathe which he exhibited last year, and which incorporates

features of his own design; another by Mr. J. W. Burgess, of Edinburgh, also incorporating minor modifications, and one by Dr. A. N. Barker, of London, N.11. Mr. E. B. Bull, of Welling, Kent, exhibits a "Utility" dividing head of his own design, utilising lathe change wheels for dividing, and a quick-reading indexing attachment for the lathe or milling machine is entered by Mr. W. R. Norton, of Ilford.

Mr. A. E. Bowyer-Lowe, of Letchworth, who has exhibited several ingenious devices in this and other sections at previous Exhibitions, produces two interesting new appliances this year, both of which are intended as attachments for a Pool milling machine. These are, respectively, a vertical milling attachment, driven by bevel gearing from the main spindle, and having a No. 2 Morse taper socket arranged to take Myford patent split collets, the head having angular adjustment up to 90 deg. either way; also a crank-operated slotting attachment, similarly equipped with means of angular adjustment, and having stroke adjustment from ¼ in. to 2 in.

An ingenious combined jig borer and vertical milling machine is entered by Mr. G. D. Reynolds, of Farnborough. This is of fabricated structure, with twin bar vertical columns and adjustable head, enclosed and bevel-driven. Indices and verniers are fitted to the feed screws, and the slides are protected by felt pads and cover strips.

A very unusual type of machine tool is that exhibited by Mr. C. H. Toogood, of Sudbury, Suffolk, who has produced several experimental models of a daringly enterprising type on previous occasions. This consists of a pitch generating machine for forming patterns of marine propellers; it embodies principles employed in full-size practice, but is of original design and fabricated from sections of solid steel.

A set of small tools, including a machine vice and two smaller vices, a pair of vee blocks, a pair of bottle-jacks and two pairs of toolmaker's clamps, is entered by Mr. E. J. Elderkin, of Ruislip. Mr. J. W. Sullivan exhibits a set of gravity dies for 10 c.c. engine pistons.

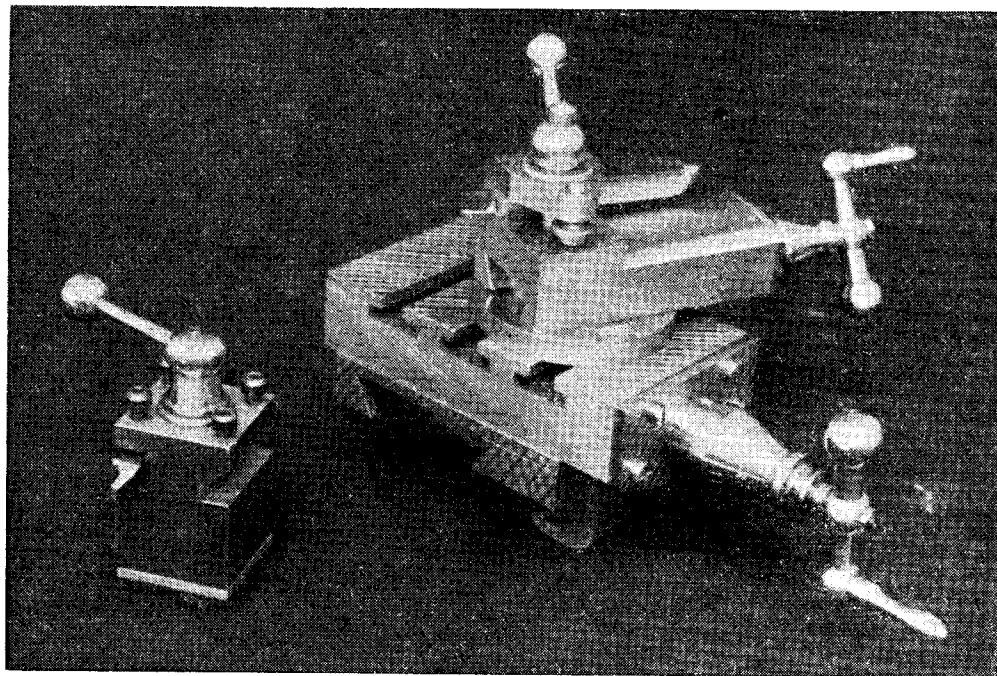
Mr. A. R. Kidd, of Watford, exhibits a Cowell 6 in. hand shaper, and other entries in this section include a compound slide-rest for a small lathe by Mr. M. J. Morant, of Farnborough, a boring head for a 3½-in. lathe by W. H. Rider, a "Duplex" twist drill grinding jig by Mr. R. S. Shute, of Chippenham, and an adjustable back centre by Mr. E. E. Jones, of Llanidloes.

Scenic and Representational Models

This section contains many interesting examples of architectural models, embracing a wide variety of buildings or groups of houses. Churches are again popular subjects, and include a scenic model of Angmering village church by Mr. W. B. Langley, of Hove, and a "period" model of Barking Abbey as it appeared before the Dissolution in 1539, reconstructed from published information. The archaeological theme is also pursued in the 4 mm. scale model of the George Inn at Norton St. Philip by Mr. S. J. Smith, of Hounslow; the Tudor style house by Mr. D. R. Davidson, of Brentwood; and the

pair of half-timbered cottages by Mr. H. E. Dear, of London, E.11. Other country cottages and gardens are featured by Mr. J. R. Silvester, of Wembley Park, while a modern note is introduced by the pair of semi-detached houses in 7 mm. scale by Mr. G. Stanley, of Upton Park, E.13, and "Western Circus, W.12," by Mr. A. Pakenham, of London, W.3, which also incorporates mechanically-operated moving vehicles, all to a scale of $\frac{1}{4}$ in. to 1 ft.

not a few innovations and novelties, is displayed here. It would appear that musical instruments, both model and full-size, are becoming increasingly popular, and an exhibit which cannot fail to arouse considerable interest is the electronic organ by Mr. C. C. Clarke, of Welwyn Garden City, a fully-up-to-date instrument working on the Hammond principle, having 84 belt-driven tone wheels, eight pistons for Great manual, 12 tabs for Swell manual, and



A compound slide-rest and two-way toolpost, by Mr. M. J. Morant

Models made from matchsticks nearly always feature in this section, but sometimes the limitations of this particular structural medium are all too apparent. It would, however, appear that something of more than usual interest in this line is furnished by at least two of this year's exhibits, namely, the bungalow made from 28,903 matches by Mr. M. H. Townsend, of Hull, and the equally ambitious model of Milan Cathedral by Mr. M. W. Ewington, of Hitchin.

Marquetry is the medium employed by M. Henri Chavaux, a *chef de cuisine*, of London, S.W.1, for the construction of a model bungalow, and also a windmill, the exterior of which is detachable to show interior construction.

Another windmill model, in this case representing St. John's Mill, Eastbourne, is entered by Mr. D. A. Dubbin, of Fulham. Mr. Z. Iwaszko, of London, W.14, exhibits a diorama model depicting a scene in the Korea campaign by the United Nations.

General Craftsmanship

In conformity with the versatile nature of the entire competition section, a wide variety, with

two Swell pedals. Of equal interest is the $\frac{1}{3}$ rd scale model of an iron-frame upright trichord piano by Mr. H. A. J. Smith, of Bexley Heath, which represents a typical British piano of the 20th century, and is complete with 85 keys, underdamper, and check action—in fact, a real working model. A $\frac{1}{6}$ th scale of a Stradivarius violin is entered by Mr. K. Popplewell, a violinist in the B.B.C. Symphony Orchestra, of Harrow; this also is complete in all details, including sound post, ebony fittings, and inlaid purfling.

A Model Loom

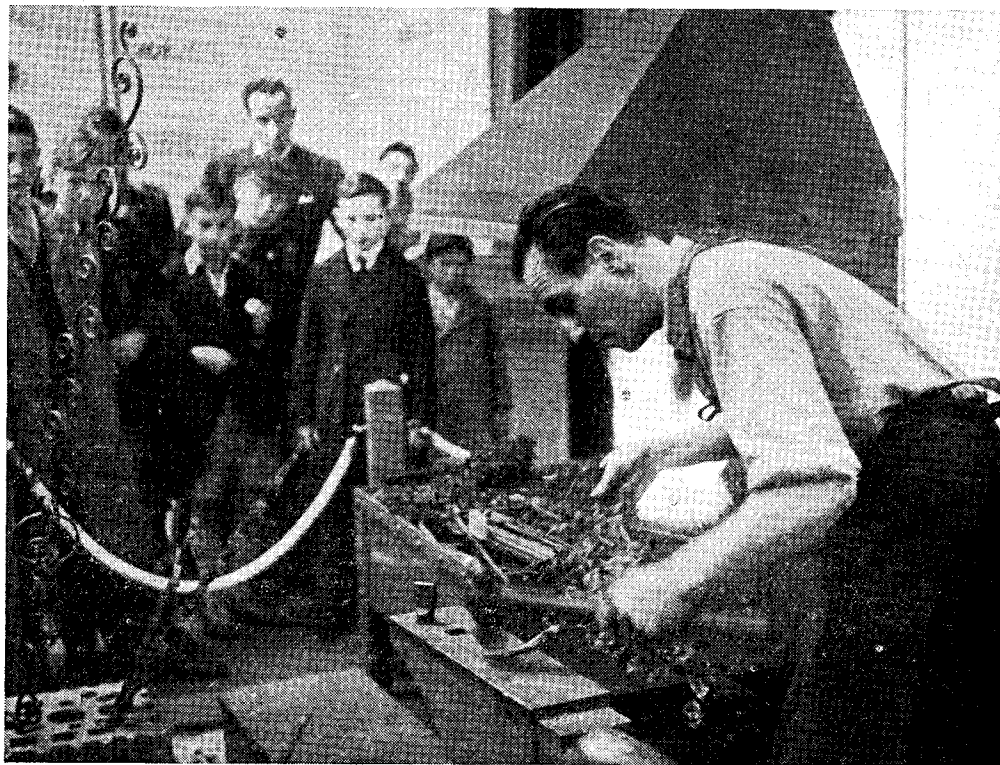
The model of a Crabtree Axminster carpet loom, entered by Mr. R. C. Porter, of Axminster, is built to $\frac{1}{8}$ th scale and incorporates full working detail, including driving clutch, gripper shaft assembly, and intermittent take-up. Another unusual model is the miniature spinning wheel by Mr. L. Parten, of Reigate. Mr. J. W. Thomas, of Cardiff, exhibits a pair of duelling pistols, half full size, in mahogany case, complete with accessories, constructed from photographs and actual examples of weapons dated about 1820.

SPECIAL ATTRACTIONS

at the "M.E." Exhibition

ONE of the most popular of the innovations at post-war "M.E." Exhibitions is the section devoted to demonstrations of methods and processes employed in model engineering and allied crafts. The value of this feature has been attested to by many of our readers, who have not only gained an insight into the various

near Tadworth, Surrey. The interest in what is now in danger of becoming a lost art has been amply proved by the keenness of the crowds constantly surrounding the forge, and many model engineers have realised the value of a knowledge of forge work in dealing with workshop problems. It is worthy of note that while



A demonstration of hand forging ornamental ironwork at last year's Exhibition

techniques by watching the methods of the demonstrators, but have also discussed their personal problems with them to great advantage.

The subjects to be dealt with this year include wood and metal turning, home moulding and foundry work, brazing, model railway construction, including the painting and lining of model locomotives and rolling stock, and laying of tracks, model aircraft, ship models, including the building of wood and metal hulls, and ship rigging, musical instrument making, etc.

Forging Demonstrations

Once again the art of hand forging will be ably demonstrated by Mr. J. A. Ibbotson and his assistant, from the forge at Walton-on-the-Hill,

the ancient traditions of the smith's craft are honoured and upheld in these demonstrations, the efficiency of the old methods is supplemented and brought fully up-to-date by using, in conjunction with them such modern features as the oxy-gas blowpipe, brazing alloys and fluxes, etc.

The "M.E." Workshop Stand will feature examples of work which have been carried out during the past year and members of the staff will be in attendance to assist visitors in dealing with workshop difficulties.

The Grand Prix Model Racing Track

The spectacular success of the model racing circuit at last year's exhibition has led to the construction of a much larger and more elaborate

track, with full scenic effects, comprising gradients, straights, hairpin bends, etc., which will test the endurance of the cars and also the flexibility of their engines. This track is 350 ft. in length, with 25 ft. of pits and about 400 model figures of pit staff, mechanics, marshals and spectators, all constructed to a scale of 1 in. to 1 ft. Three teams of Formula 2 racing cars have been specially designed for this demonstration, in the correct national racing colours; they race three abreast, being started simultaneously by a mechanical release device, and steered automatically around the track. Three complete demonstrations, consisting of two heats and a final at each session, will be given daily.

This feature is produced by Mr. Rex Hays, of Steyning, Sussex, one of the best-known car modellers in this country, and also an expert in full-size motor car racing.

The "Duplex" Stand

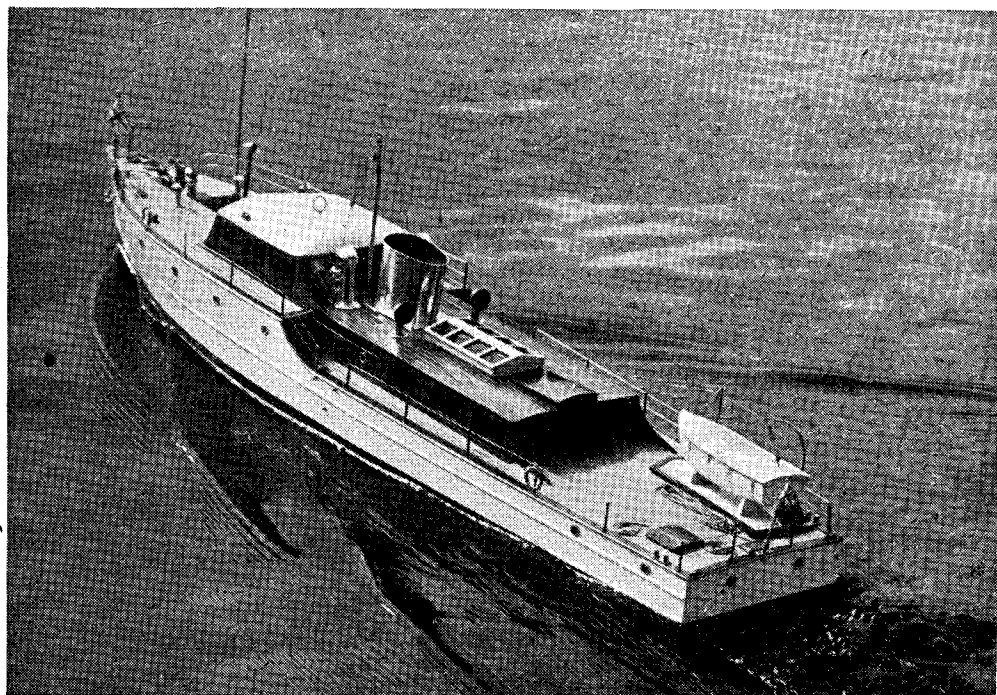
The regular articles which appear in THE MODEL ENGINEER under the "Duplex" *nom-de-plume* are followed by all readers who are interested in the construction of hand or machine tools, accessories and attachments, and the display on this stand will feature many of the items which have been described in the above articles. These include the bench hacksaw machine, the twist drill grinding jig, sand-blasting apparatus, tailstock drilling attachments and a workshop camera. New items include a small electric muffle, a jigsaw machine, and a workshop stove enamelling plant. The use of the various appliances will be demonstrated, and readers

will have an opportunity of meeting the authors of the articles in person, and discussing matters of mutual interest in connection with workshop equipment and methods with them.

The Demonstration Tank

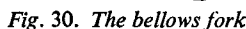
This feature, which was such an important feature of last year's Exhibition, will be somewhat smaller this year, the dimensions being 22 ft. \times 22 ft. It will be at a slightly lower level, by which means it is hoped that more people will be able to see what is going on. Wind will be provided by a battery of fans, so that yachts may be enabled to sail. We are hoping to demonstrate the manoeuvring of yachts by radio control. This is a development which, although still in its very early stages, will, when perfected, have a most revolutionary effect on the whole art of model yacht sailing. Power boats will be demonstrated under radio control. These include Mr. J. Starkey's paddle steamer *Medway Queen*, the cabin cruisers *Ivy May*, and *Geebaa*, and H.M.S. *Liana*, a destroyer whose guns may be swivelled and elevated, and her torpedo tubes swung to port or starboard. It is possible we may have Norman Ough's fully detailed model of a modern cruiser, operating under radio control.

An entirely new feature will be the model of a racing four, with the oarsmen operating their blades with full feathering action as in actual practice. This is to the scale of 1 in. = 1 ft., and was made by Major H. C. B. Griffith, M.B.E. as a result of a challenge from Col. Fraser. Major Griffith accepted the challenge, and after much study and experiment, produced the model.



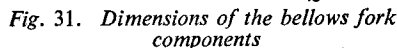
Mr. A. T. Trotter's cabin cruiser "Ivy May"

THE construction of the bellows fork assembly (P), Fig. 4, is illustrated in Fig. 30, and the dimensions of the various parts are shown in Fig. 31. The purpose of this fork is to carry the wooden frame to which the two sections of the bellows are fastened in order to prevent sagging. In addition, the fork pivots on the upper V-block (M), and the wooden frame can



Here, the central pivot stud for the fork base is fitted into the block itself, and a threaded hole for the clamp-screw is provided on each side of the pivot ; the reason for the provision of a second hole will be explained later. The $\frac{1}{16}$ in. dia. hole for the guide shaft is not drilled at this stage. The built-up fork, which pivots on the V-block, carries a quadrant plate (*Qe*) on the right-hand side, and the two pivot-screws with their grub-screw locks are fitted as in the front slide.

The back slide, then, allows the camera back to be both swung sideways and tilted in the vertical plane; a cross movement could be incor-



also tilt on the pivot-screws fitted to the side members of the fork ; this free movement allows the frame to align itself when the tilting and swinging movements of the camera back and front are in use. A pointed locking-screw is also fitted to the right-hand side member of the fork ; this engages in the metal plate attached to the frame and secures it in the vertical position.

It will be noticed that the pivot-screws in all the forks supporting the bellows are uniformly located, at $4\frac{1}{2}$ in. above the surface of the bed V-blocks in order to centre the camera parts correctly.

The base of the slide consists of a V-block (Qa , Fig. 33), machined to the same dimensions as for the front

Continued from page 456, "M.E.,"
October 2, 1952.



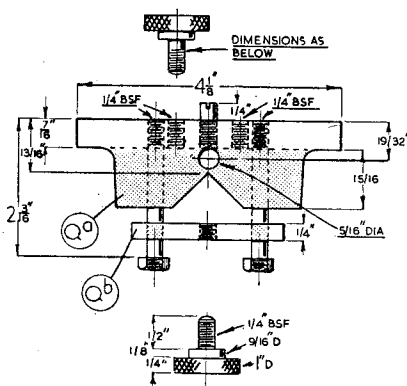


Fig. 33. The back slide and clamp-screws

porated, but this is hardly necessary where a cross front is provided, and the same effect can also be obtained by making use of the back and front swinging movements.

The Focussing Slide (R), Fig. 4

When this component is clamped to the bed and the back slide is unclamped, any movement of the focussing lever will cause the back slide to travel along the bed, and so will provide a fine-focussing motion.

The V-block forming the slide does not carry a fork; so, as shown in Fig. 36, its upper part can be made smaller for the sake of appearance. When fitting the $\frac{5}{16}$ in. dia. silver-steel guide bar (Rb) it is essential for smooth and shakeless working that the bore should be accurately aligned in both the V-blocks concerned. The easiest way, perhaps, to ensure this is to clamp both the V-blocks securely on a short length of $\frac{7}{8}$ in. square material; the

blocks are then bolted to an angle-plate, and the square bar is set vertical with the aid of a try-square resting on the surface plate. Next, a reaming-size drill is put right through both blocks. The reamer is started in the forward block (Qa) and is worked in until its tip is level with the surface of the second block. With the parts still clamped to the angle-plate, the guide shaft is pressed firmly into place in the focussing block. It should then be found that the slide block will move freely and without shake, when the assembly is mounted on the bar bed and the focussing block is clamped to the bed.

The Fine-focussing Lever and Link Bar (Rd) and (Re), Fig. 38

As shown in Fig. 39, the lever is of built-up construction and is fitted with a ball handle. The pivots for the lever and link are made of silver-steel to prevent scoring of the bearing surfaces.

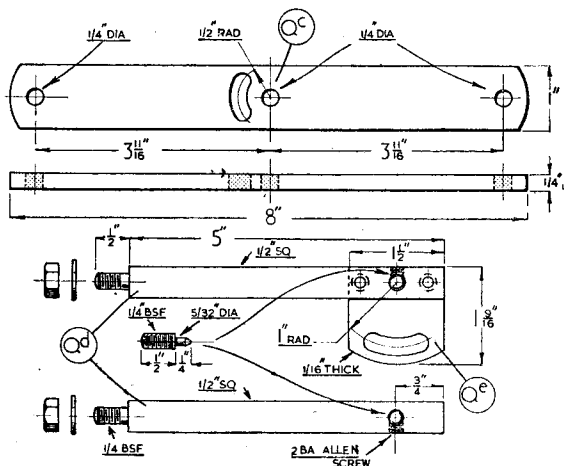


Fig. 34. The back slide fork parts

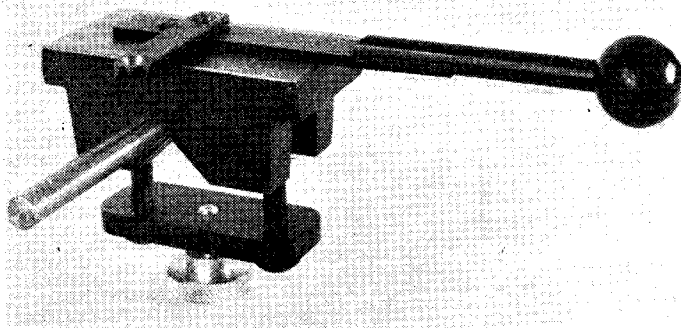


Fig. 35. The focussing slide and guide bar

The heads of these screws are machined to an included angle of 60 deg. to fit the recesses formed with a centre drill in the moving parts. The two long screws are locked with Allen set-screws and, to facilitate assembly, the screw in the focussing block is inserted from behind, as this pivot is assembled last when the other parts are in place. The short screw holding the link to the lever should be made tight on its threads so that adjustment can be made without danger of the screw slackening.

With this arrangement, all

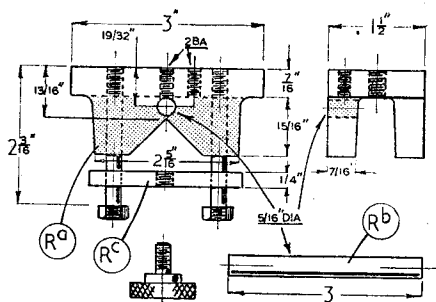


Fig. 36. Details of the focussing slide

the pivot screws can be adjusted to eliminate backlash and give smooth working.

The reason for providing a second hole in the

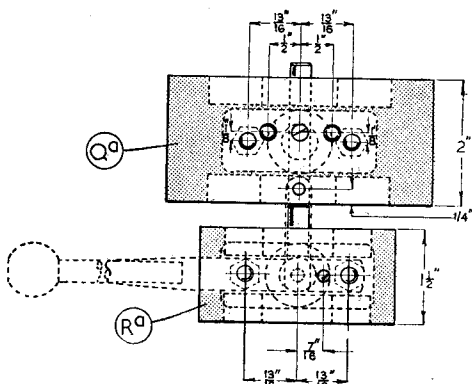
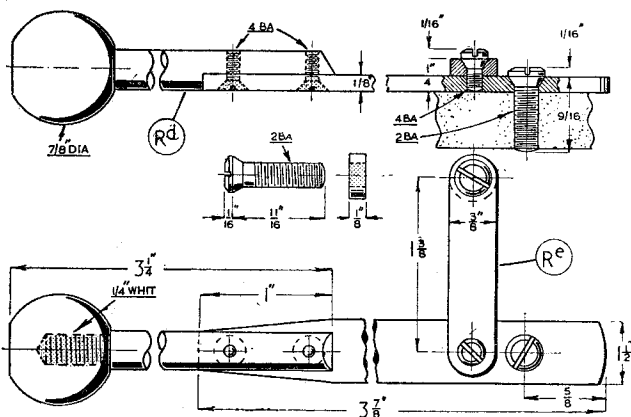


Fig. 37. Plan view of the back and focussing slides



lever in mid-position ; in practice, however, the rear end of the link is pivoted $\frac{1}{8}$ in. to the left of the centre-line, in order to reduce the angularity of the link at either end of the lever's travel.

(To be continued)

Left—Fig. 39. Details of the focussing lever and link bar

backslide for the fork clamp-screw is that this allows the fork to be replaced after the backslide has been turned end for end. Normally, the focussing block is mounted behind the slide block to allow the bellows to close fully; but should the full length of the bed be required for very close work, the backslide assembly is reversed so as to bring the focussing slide to the front. A $\frac{1}{2}$ in. range of movement has been found satisfactory for fine focussing, but this can readily be altered, if needed, by changing the position of the link pivot in the focussing lever. For the sake of clarity, the link is shown in the drawing as lying on the centre-line, with the

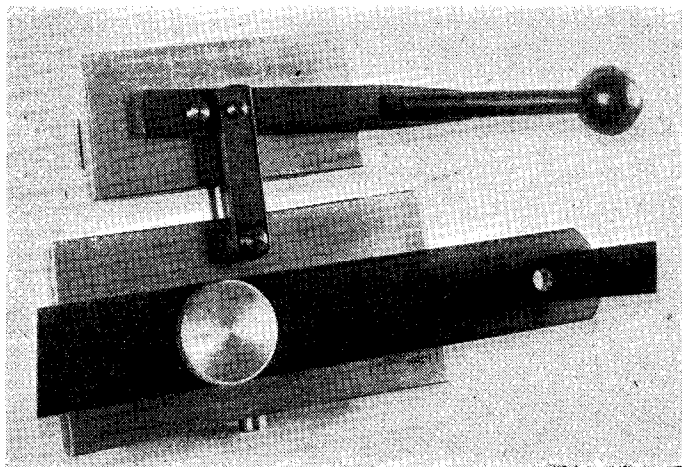


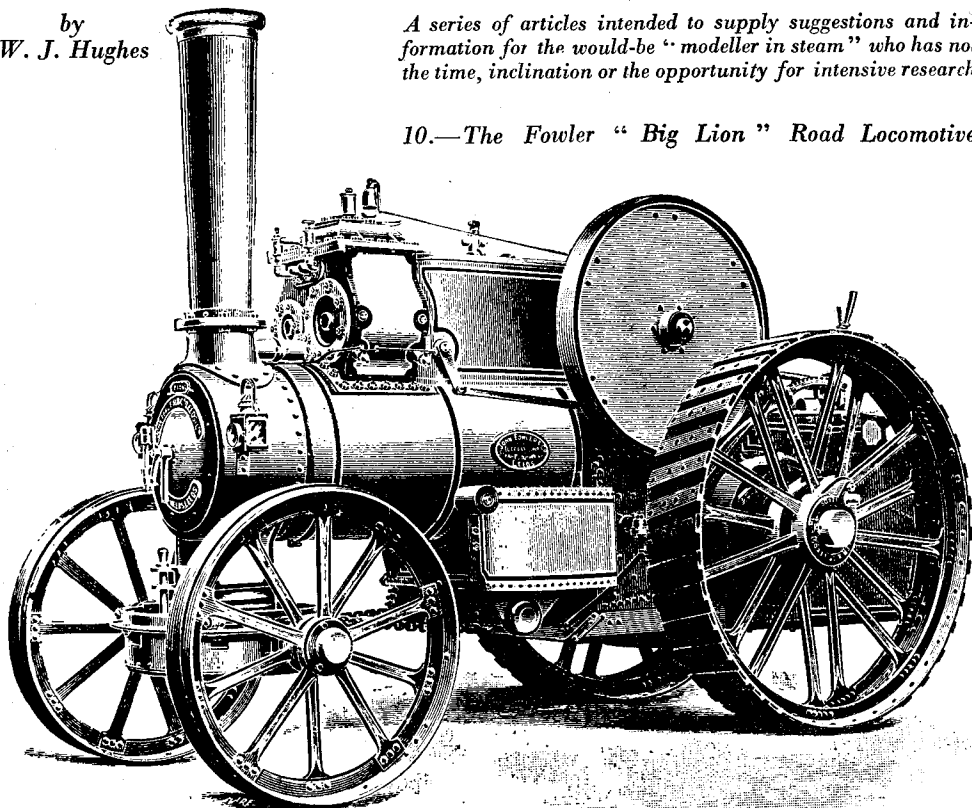
Fig. 38. The assembled slides and fine-focussing mechanism

"Talking about Steam——"

by
W. J. Hughes

A series of articles intended to supply suggestions and information for the would-be "modeller in steam" who has not the time, inclination or the opportunity for intensive research

10.—The Fowler "Big Lion" Road Locomotive



Courtesy]

Fig. 37. A light Fowler road locomotive of 1896, with spoked flywheel covered with plates. Note roller attached to belly-tank to protect paint when belt was in use

[A. R. Dibben

THERE can be few model engineers who have not thrilled at the sight—and sound—of a magnificent road locomotive hauling a heavy load along the public highway, or of a brilliant showman's engine rocking gently and humming to herself as she generated power for the Venetian gondolas or fearsome dragons of her owner's "ride."

Built to scale, models of these engines prove equally fascinating to members of the fraternity, and one has only to recall F. G. Bettles's fine models, or the 2-in. scale Fowler by the brothers Verity, to realise that this fascination is well justified. At the same time it must be admitted that some pretty horrible examples have been perpetrated at one time or another!

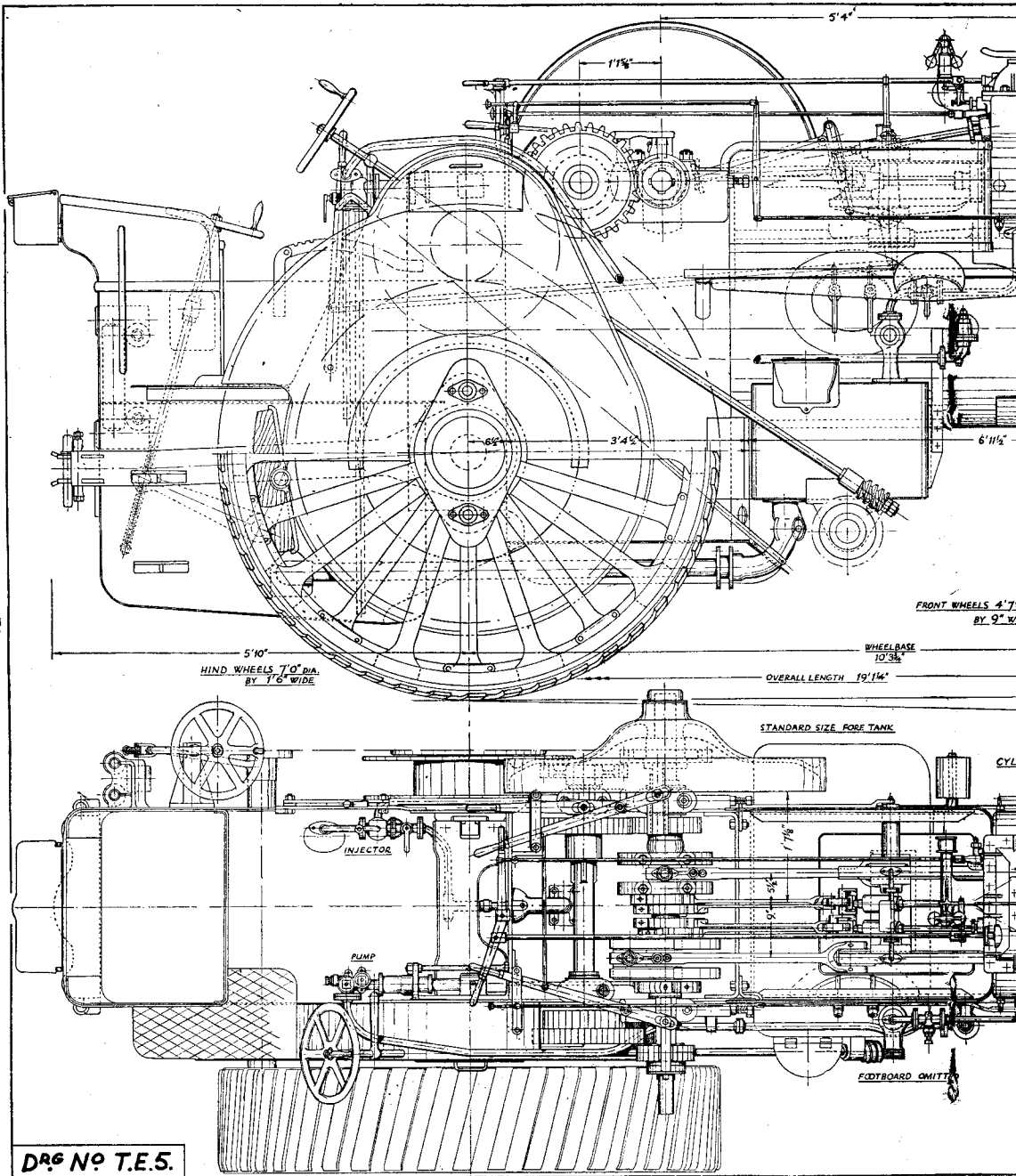
One of the Best

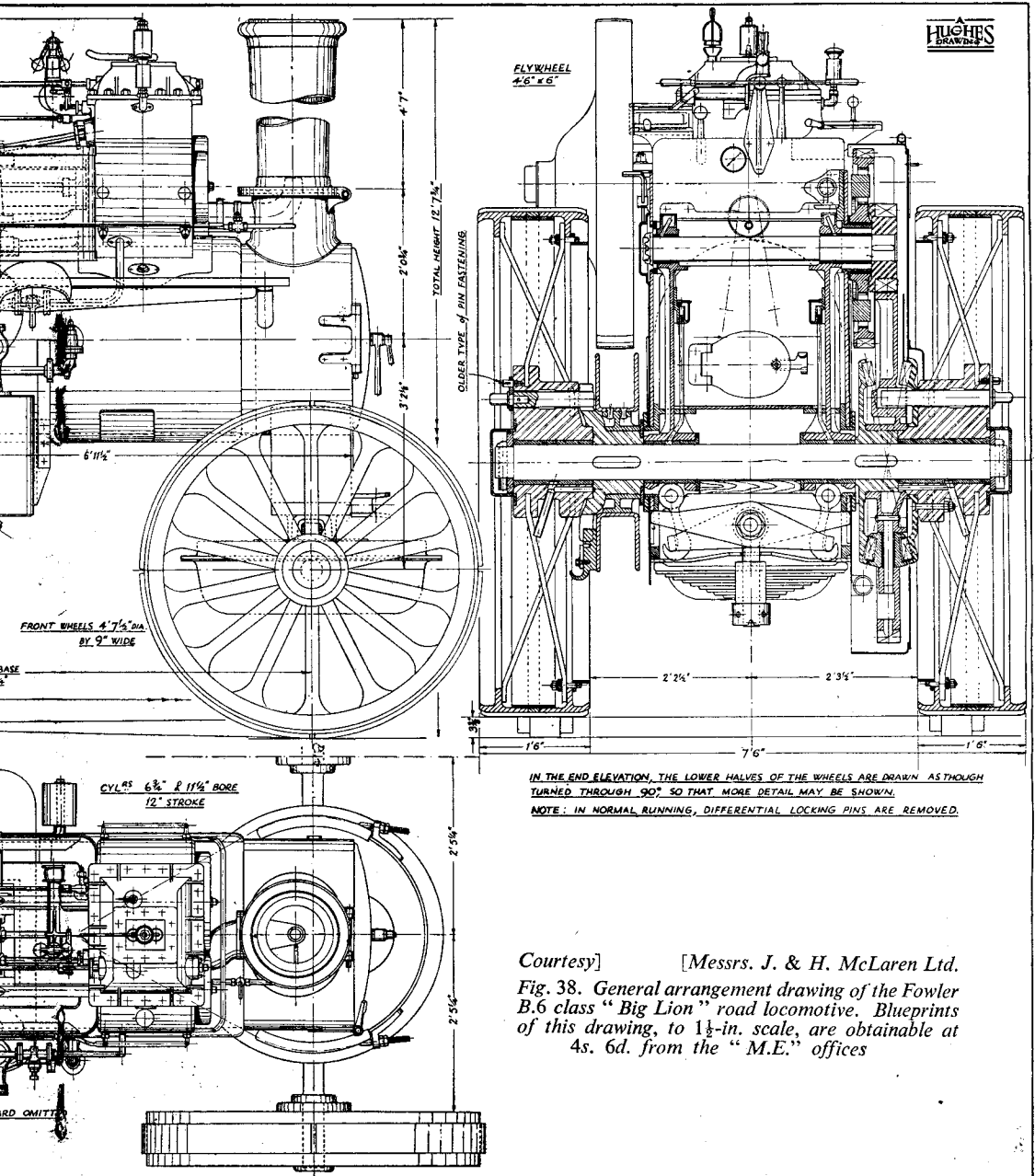
As to which was *the* best of all the prototypes, this will always be a matter of opinion and a source of argument, but without a doubt the Fowler "Big Lion" was *among* the best, for

all forms of heavy haulage. And having thus, I hope, diplomatically prevented some heated shafts of abuse being hurled at my head by Burrell or Foster addicts, let us get on with the description of the locomotive!

There were, of course, differences in detail in design and appearance of "Big Lions"; some were made by Fowlers themselves as the years went by; some were the result of overhauls or rebuilds; and some had their origin in the foibles and fancies of the individual owners. But, in general, the characteristic outline of the "Big Lion," and its main points of design, were not very different from the first to the last of the line.

In addition, there were the "Little Lion" and "Super Lion," of 7 and 10 n.h.p. respectively, which most people would not be able to recognise as being any different from the "Big Lion" itself, since the appearance was almost identical, with differences chiefly in sizes and power developed. In the table which follows,





Courtesy] [Messrs. J. & H. McLaren Ltd.
Fig. 38. General arrangement drawing of the Fowler B.6 class "Big Lion" road locomotive. Blueprints of this drawing, to 1 1/2-in. scale, are obtainable at 4s. 6d. from the "M.E." offices

some of these differences are noted, as a matter of interest.

Nominal h.p. ..	7	8	10
Name	<i>Little Lion</i>	<i>Big Lion</i>	<i>Super Lion</i>
Maximum i.h.p. (for short periods)	87/95	109/120	115/125
Continuous i.h.p.	53/59	67/76	70/80
Overall length ..	18' 7"	19' 9"	19' 9"
Overall width ..	7' 7"	7' 7½"	7' 11½"
Wheel base ..	10' 6½"	10' 11½"	10' 11½"
Height to top of chimney ..	11' 6½"	12' 1½"	12' 1½"
Weight in working order (tons) ..	14½	16½	17½
Commercial net load (tons) ..	24	28	32

These figures are taken from a Fowler catalogue of the late twenties, and the last row—the commercial net load—may be regarded as a very modest claim by the makers, for in actual practice users frequently exceeded these figures by a handsome margin.

Incidentally, if you check the figures given above for length, wheelbase, width, and height, with those given in my 1½-in. scale blueprint (which is reproduced herewith on a smaller scale), you will find that they do not tally! It is things like this which tend to drive an earnest and enquiring model engineer scatty, but is simply explained by the fact that the basis of my drawing was an official Fowler drawing which was made nearly twenty years before the catalogue was published. In the intervening period, of course, the dimensions were altered due to improvements in design by the makers. However, anyone building a model to the blueprint can rest assured that it will truly represent a Fowler of the period 1909-1910.

A Slight Diversion

These differences in dimensions have caused me some considerable trouble, too, because as mentioned some time ago in this series, I am preparing a drawing of Fowler showman's fittings for the use of model engineers who are working to the general arrangement drawing, but who wish to finish the locomotive in showman style.

The snag is that official drawings of showman's fittings of the 1910 period are no longer available, and so I am having to use those of a later period. Thus, owing to the alterations in dimensions of the two periods, the later drawings need a fair amount of adaptation to fit them to the earlier ones—which explains in part the long delay in announcing publication of the "showman" drawing, by the way. However, things are now going quite smoothly, and it should not be very long before the drawings are finished and traced.

Brief Specification

Reverting to the locomotive itself, it has a compound engine, of 6½ in. and 11½ in. bore by 12 in. stroke. The cylinders are side-by-side, with the valves overhead.

The crankshaft is of orthodox design, with 90-deg. cranks which are fitted with balance-weights, and a heavy disc-type flywheel, well dished, is mounted on its left-hand end. Three speeds are fitted, and the locomotive is of the four-shaft type—that is, with two intermediate shafts between crankshaft and hind axle. I shall describe the gear-change arrangements in the next instalment, all being well.

A transverse leaf spring is fitted to the front axle, and the hind axle has a compensated spring motion which also will be described later. Also fitted to the hind axle are the compensating-gear, or differential, and the winding-drum.

Of quite orthodox design, the tender carries the water-tank below the footplate, with the coal-space behind. The strain of haulage is taken by the drawbar on the back of the tender, through two strong metal straps which pass along the sides of the tender and are bolted to the horn-plates and axlebox horn-cheeks.

As is usual with road locomotives, an extra water-tank is fitted—in this case a belly-tank—with a compensating pipe between the two tanks to keep the same level in each. An expansion joint is fitted in this pipe to allow for boiler expansion, and a cock is fitted in the cast bend, operated by a rod from the footplate. The idea is, of course, that with the tanks full, and if the locomotive were ascending or descending a steep hill, water would flow from the lower tank. When the cock is closed this is prevented.

The water-filling pocket is fitted to the fore-tank, on the off-side, and on top of the tank is the water-lifter, supplied by steam by a pipe passing from the cylinder-base. The hose is carried on a bracket mounted on the footboard, which is seen on the side-elevation, but has been omitted from the plan to allow details of clacks and water-lifter to be seen.

Illustrations

With the Editor's permission, I propose to deal with the "Big Lion" in some detail, because it will save space in later articles dealing with road locomotive and traction-engine prototypes. (Among these will be the Fowler 6 n.h.p. single-cylinder general purpose traction, the Burrell ditto, and the Burrell showman's engine, but all in good time. Must try to keep a balance between the various types of steam-engine!)

Among the details will be quite a few photographs, of course, as well as drawings. One photograph which should be very useful to a modeller was reproduced on the cover of THE MODEL ENGINEER dated February 14th, 1952, and a further one is on page 212 of the same issue.

The present illustrations show two Fowler road locomotives, the first being an engraving taken from a catalogue of 1896, which was lent to me, with other very useful and valuable material, by my old friend Mr. A. R. Dibben, of Timperley. This is a comparatively light machine—the smoke box door bears a legend "8 tons"—but the Fowler good looks and characteristics are already well displayed.

The second illustration is from an album of official Fowler photographs kindly loaned to me by Mr. T. D. Walshaw, and it corresponds in period approximately to the general arrangement

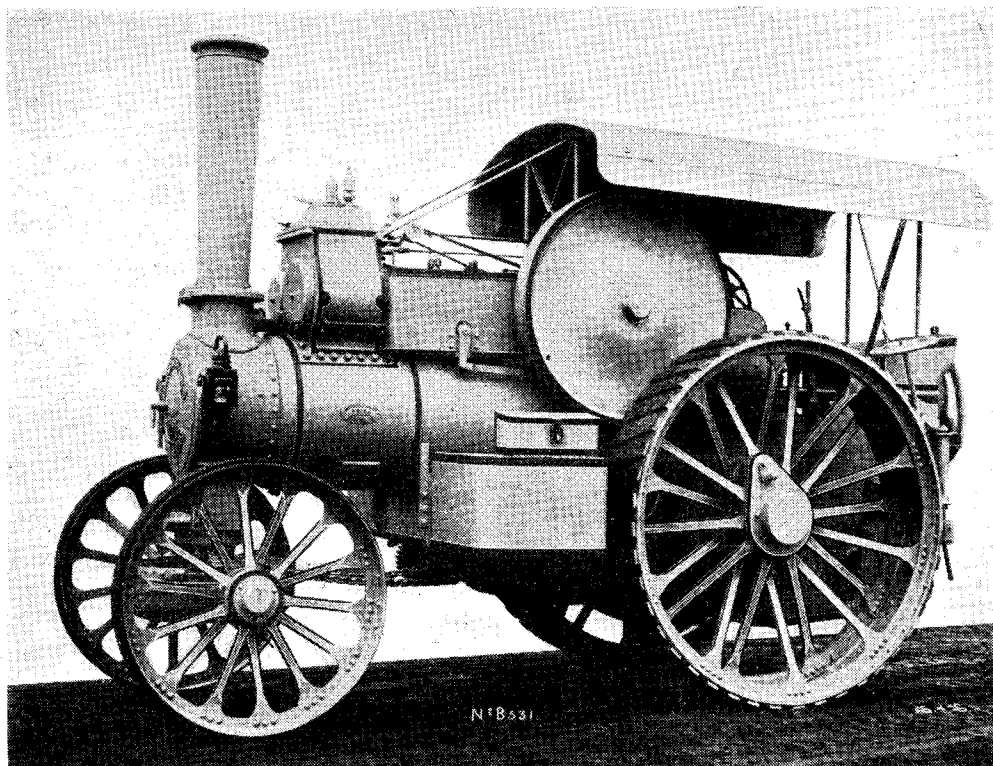


Photo by courtesy] [T. D. Walshaw Photograph No. 12. Fowler road locomotive of 1910. Differences include spud-pan drawn from sheet, front axle sprung, larger belly tank, tool-box on tank instead of tender side, weigh-shaft not close to cylinders, cast flywheel, and more spokes to road-wheels

drawing. The photograph, however, is of a two-speed engine, as evidenced by the flywheel, which is dished only slightly. On the three-speed machine, the extra-fast or third speed is mounted

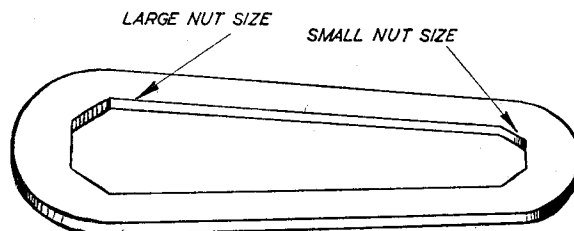
between flywheel and hornplate, necessitating the deeply-dished flywheel shown on the drawing.

(To be continued)

A Useful Adjustable Spanner

THE type of spanner illustrated in the drawing below has been found of value in the writer's workshop, particularly in the smaller sizes of Whitworth and British Association sizes.

For B.A. sizes the material used should be about $\frac{1}{8}$ in. thick, while for Whitworth sizes from $\frac{1}{4}$ in. up to and including $\frac{1}{2}$ in., $\frac{3}{8}$ in. or $\frac{1}{2}$ in. mild-steel plate is advisable. The completed spanner should be case-hardened and preferably "blued."



This type of spanner does not, of course, compare with the normal form for tightening nuts or bolts, although, in the smaller sizes it will tighten them fully, while in the larger sizes— $\frac{3}{8}$ in. and over—it will get them well beyond finger tightness.

The particular value of this useful form of spanner has been found to be in the rapid assembling and dismantling of apparatus and machinery during manufacture.

—A. SMITH.

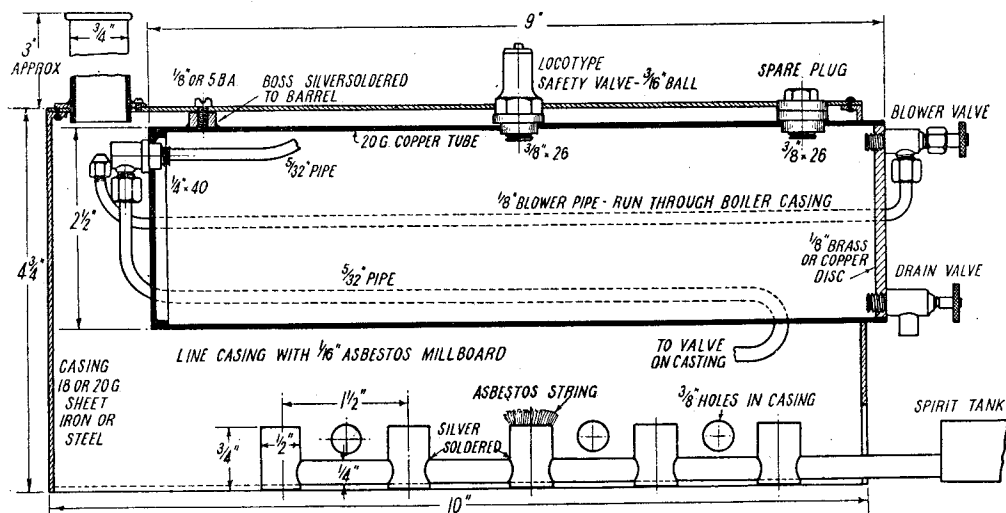
A Steam Calliopette by "L.B.S.C."

Something for the Kiddies—

This'll make 'em whistle !

SUNDRY followers of these notes have been reminding your humble servant lately, that if I proposed to describe something that they could make for amusing the kiddies around Christmas time, not to leave it until the last minute. Some of them are slow workers, others are short of spare time, and so on. O.K., well, as these notes should appear about the middle of October, all being well, there should be plenty of time for the average worker to make the box of tricks set out below. As I have previously described various kinds of toy locomotives, stationary engines, and so on, I thought we would have a bit of a change, and so am offering something which is a little out of the ordinary. When

The boiler is easy enough to make, being a plain barrel in a rectangular casing, and can be fired either by a spirit lamp as shown, one of my oil burners as described in the *Live Steam Book*, or by a gas burner. The barrel is a 9 in. length of $2\frac{1}{2}$ -in. seamless copper tube, 20 or 22-gauge, squared off at both ends in the lathe. The front end is closed by a flanged disc of 16-gauge copper, made in the same way as described for loco-type smokebox tubeplates; the back end is closed by a disc of $\frac{1}{8}$ -in. copper, or a stamped brass blank would do. Bevel the edge a little, to form a channel all around for the silver-solder, with which both ends are fixed. The $\frac{1}{8}$ -in. metal allows the fittings to be screwed in without



Section of boiler for the small calliopette

I first saw and heard a steam-operated calliopette at Greenwich, Conn., around 23 years ago, I thought at the time, that a wee one could easily be made from locomotive components; but this is the first time I have ever got out a design for it. The steam part of it isn't complicated enough to be beyond the ken of any intelligent kiddy, either boy or girl; and the musical (did I hear somebody laughing?) part is so simple, that the operator should be able to play simple tunes after only a few minutes' practice. If dad or mum can play the piano, they will probably be having a go themselves; if the little calliopette whistles are properly tuned, which is easy enough to do, the notes will blend perfectly, and a tune played in chimes should sound very pretty indeed. Now to construction.

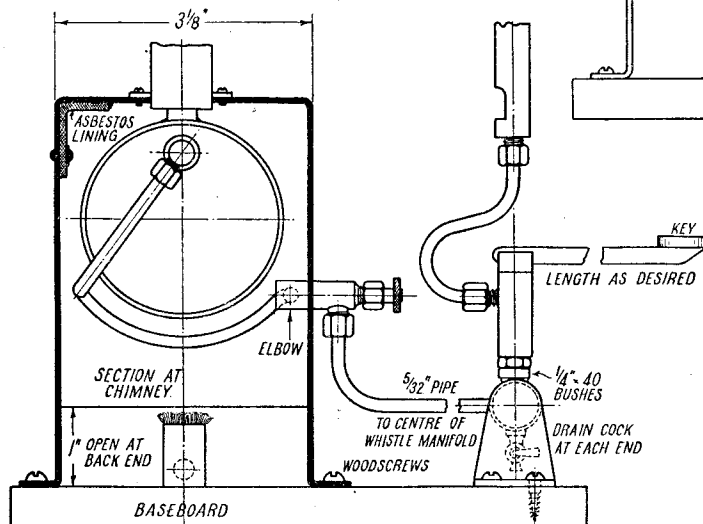
bushes. One $\frac{1}{4}$ in. \times 40 bush is needed in the front plate, for the superheater elbow, and two $\frac{3}{8}$ -in. \times 26 bushes in the upper part, for the safety-valve and plug. A spare plug is shown, as the boiler could then be used for testing, by screwing a valve or other fitting in the plug bush.

The boiler casing is made from 18- or 20-gauge sheet steel, or stout tin would do quite well, a piece measuring 10 in. \times 13 $\frac{1}{2}$ in. being required. Bend $\frac{1}{2}$ in. of each shorter end at right-angles, to form the bottom flanges, then bend the rest into a channel, 4 $\frac{1}{2}$ in. high and 3 $\frac{1}{2}$ in. wide as shown. A piece approximately 5 $\frac{1}{2}$ in. \times 3 $\frac{1}{2}$ in. will form the front end, the edges being bent over to fit inside the casing, to which they are riveted by $\frac{1}{8}$ -in. iron rivets. The back end is 1 in. shorter, the bottom part being left open to admit the

burner. A $2\frac{1}{2}$ -in. hole is cut in this, to let the boiler barrel come through. The casing is lined with $\frac{1}{8}$ -in. or $3/32$ -in. asbestos millboard, fixed with $\frac{1}{8}$ -in. iron rivets with large sheet-metal washers between the heads and the asbestos. At $\frac{1}{2}$ in. from the front end, on top of the casing, drill a $\frac{1}{2}$ -in. hole for the chimney; at 5 in. beyond this, drill a $\frac{1}{8}$ -in. hole for the safety-valve, and a similar hole at 1 in. from the back end, for the plug. A No. 30 hole is also needed at $1\frac{1}{2}$ in. behind the centre of the chimney hole, for the screw holding up the front end of the boiler. Put the boiler temporarily in place in the casing, so that it projects $\frac{1}{2}$ in. through the hole in the back; see that the superheater bush is at the top of the front end. Then mark through the holes in the casing, the positions of fixing screw, safety-valve bush, and plug bush. Remove boiler, drill $\frac{1}{2}$ -in. holes for safety-valve and plug bushes, turn them from bronze or gunmetal rod, and silver-solder them in. A little boss is silver-soldered on to take the fixing screw, as shown.

Boiler Fittings

The boiler fittings and mountings are all of

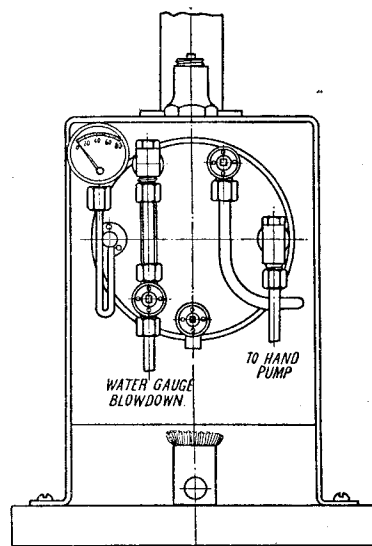


Left—Chimney end of calliope. How to connect up

my "regulation" type, and full details of how to make them have been given "many a time and oft," so no repetition should be needed. An elbow fitting made from $\frac{3}{8}$ -in. round rod, carrying a $\frac{1}{2}$ in. \times 40 union nipple, and a piece of $5/32$ -in. pipe as shown (both silver-soldered in) is screwed into the bush in the front end of the boiler barrel. The superheater is a loop of $5/32$ -in. copper tube, furnished with a union nut and cone for attachment to the elbow. It goes between boiler and case, to the rear end, dips below the barrel as shown in the end view, and returns along the other side, terminating in an elbow, to which it is silver-soldered. One of my "standard" $5/32$ -in. angle valves, as used for controlling steam supply to injectors, blowers, etc., is screwed into the elbow through a $\frac{1}{2}$ -in. hole drilled in the

casing, as shown both in the end view, and the detail sketch. Thus the superheater loop is always full of steam when the boiler is in use.

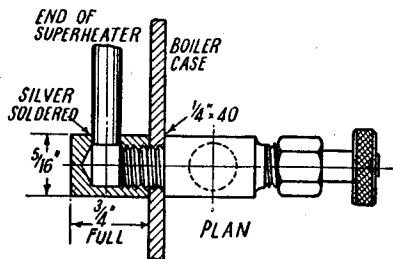
The loco-type safety-valve contains a $\frac{3}{16}$ -in. ball on a $5/32$ -in. reamed and D-bitted seating;



Back end of boiler

it should be set to blow at about 50 lb. The plug is turned from $\frac{1}{8}$ -in. rod. The blower valve is another of my "standard" steam valves, screwed into the $\frac{1}{2}$ -in. end plate. The blower pipe is $\frac{1}{8}$ in. diameter, attached to the nipple on the valve by $\frac{1}{2}$ -in. \times 40 nut and cone. This goes between casing and chimney, via a hole in the back of the casing, and has a blower jet screwed on to the end; this is drilled No. 70. The projecting end of the boiler barrel carries one of my locomotive water gauges, with $5/32$ -in. glass; a steam gauge, which needs only to read to 80 lb.; a drain valve, similar to the blower valve, but minus pipe and gland; and clackbox or check valve for boiler feed, containing a $5/32$ -in. ball on a $\frac{1}{2}$ -in. seating. The pipe from this can be attached to a hand pump, mounted on the base-

board; the pump is made to the instructions given for tender pumps, excepting that the bottom valve cap is made like those specified for eccentric-driven pumps, and a suction pipe attached. A rubber tube may be slipped over the suction pipe, and dropped into a cup or other receptacle containing water, when the boiler "needs a drink." The chimney is a 3-in. length of $\frac{3}{4}$ -in. tube, with a flange about $1\frac{1}{4}$ in. diameter



Main steam valve

silver-soldered to it, $\frac{1}{4}$ in. from bottom, same being screwed to the casing as shown. The beading at the top is half-round $\frac{1}{16}$ -in. wire, silver-soldered on.

The spirit-burner ("poison-gas plant") shown, consists of five $\frac{3}{4}$ -in. lengths of very thin brass tube silver-soldered to a $\frac{1}{2}$ -in. feed pipe as shown; discs of thin brass are silver-soldered to the bottoms of the tubes. A nick is filed in the feed pipe, where it passes through the burner tubes, to supply spirit to the wicks of loosely-packed asbestos string. The spirit tank is a rectangular reservoir about $1\frac{1}{2}$ in. square and $\frac{3}{4}$ in. high, it need not be very large, as it can be replenished easily when the boiler is in steam. Four $\frac{3}{8}$ -in. holes are drilled in the casing at each side, as spirit needs plenty of air "to take the poison out of the gas," as one of my correspondents put it. Alternatively, one of my "improved Carson-type" vaporising paraffin burners could be used; or a gas burner, as described some time ago for boiler testing. Incidentally, apart from its use as a "melody-maker," this boiler would drive a stationary engine with a cylinder $\frac{3}{8}$ -in. bore and 1 in. stroke, in which case the hand pump could be dispensed with, and water supplied by an eccentric-driven pump $\frac{3}{16}$ -in. bore and $\frac{1}{2}$ -in. stroke, worked off the crankshaft. The exhaust should be turned into a blastpipe fitted below the chimney, same as in a locomotive smoke-box.

The Mechanical Part

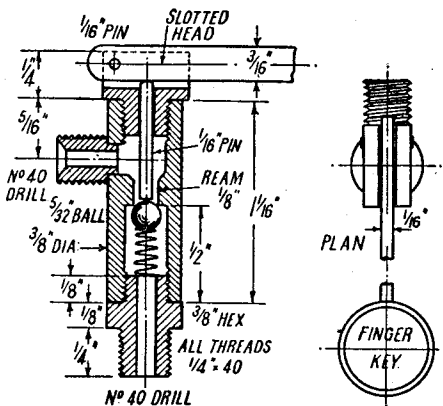
The manifold carrying the whistles is a piece of $\frac{1}{2}$ -in copper tube supported by brackets as shown, made of sheet copper and silver-soldered to each end; two drain cocks are needed, to get rid of condensate water when starting from cold. The length of the tube depends on the number of whistles you would like to install. For the tunes the kiddies would play, the minimum would be, say, one complete octave—eight full tones and five semitones—with five or six notes above and below the range of the octave; about 25 in all.

The tune which was my favourite in childhood days, Schubert's Serenade (I still love it) could be played on that range. Anyway, it is the builder's choice. The whistle bushes, made from $\frac{3}{8}$ -in. rod and tapped $\frac{1}{4}$ in. \times 40, are spaced between $\frac{3}{8}$ in. and $\frac{1}{4}$ in. apart, and silver-soldered into holes drilled in a straight line along the top of the manifold tube. This is connected to the steam valve on the boiler, by a $\frac{5}{32}$ -in. or $\frac{3}{16}$ -in. pipe silver-soldered into the centre of it, and furnished with a union nut and cone, the attachment being shown in the end view, which also shows how the manifold is mounted on the base-board.

The Whistle Valves

These form a simple lesson in mass production; one is shown in the section. For the nipples, part off as many $\frac{1}{4}$ -in. lengths of $\frac{3}{8}$ -in. hexagon brass rod, as will be needed for all the whistles. Centre each, and drill a No. 40 hole clean through. Turn down $\frac{1}{4}$ in. of the outside to $\frac{1}{4}$ in. diameter; screw $\frac{1}{4}$ in. \times 40; reverse in chuck, and repeat operation for $\frac{1}{4}$ in. length. If you note the reading of the "mike" collar on the cross-slide handle when turning the first to size, no further measurement is needed if the handle is set to the same reading (or in the same position, if no collar is provided) for the rest of the nipples. Chamfer the corners of the hexagon.

Part off enough $1\frac{1}{16}$ -in. lengths of $\frac{3}{8}$ -in. round rod for the bodies. Centre each, and drill through No. 34. Open out and bottom to $\frac{1}{2}$ in. depth with 7/32-in. drill and D-bit; tap $\frac{1}{4}$ in. \times 40. Reverse, open out to 7/32 in.



Whistle valve

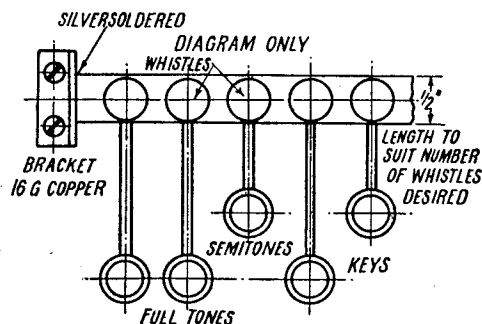
diameter for $\frac{7}{16}$ in. depth, and tap as before ; run a $\frac{1}{8}$ -in. parallel reamer through the remains of the No. 34 hole. Drill a $\frac{5}{32}$ -in. hole in the side, into the shallower hole, $\frac{5}{16}$ in. from top, and fit a $\frac{1}{4}$ in. \times 40 union nipple in it ; silver-solder the lot at one heating. Seat a $\frac{5}{32}$ -in. ball on each D-bitted seating, and assemble as shown, with a light spring of hard bronze wire between ball and cap.

Part off sufficient $\frac{7}{16}$ -in. lengths of $\frac{7}{16}$ -in. rod,

for the slotted nipples ; centre each, drill No. 51 right through, turn down $\frac{3}{16}$ in. length to $\frac{1}{4}$ in. diameter, and screw $\frac{1}{4}$ in. \times 40. File a flat each side of the head, and slot a full $\frac{1}{16}$ in. wide and $\frac{3}{16}$ in. deep. Failing a milling machine, the quickest way of doing this is to drill and tap a $\frac{1}{4}$ in. \times 40 hole in the end of a bit of square rod, $\frac{3}{16}$ in. or larger ; screw a nipple into it, and set it in a machine-vice (regular or improvised) on the lathe saddle, at such a height that when traversed under a $\frac{1}{16}$ -in. saw-type cutter mounted on a spindle between centres, the cutter forms the $\frac{3}{16}$ in. depth of slot at one traverse. Unscrew the slotted piece, screw in a blank, traverse under the cutter, and ditto repeat until the lot are done—it won't take long ! File the flats afterwards if this method is adopted. The push-rods are made from $\frac{1}{16}$ -in. rustless steel or nickel-bronze rod, for preference, but anything may be used at a pinch ; same applies to the $\frac{3}{16}$ -in. \times $\frac{1}{16}$ in. levers. The keys are simply discs of brass, parted off a $\frac{1}{2}$ -in. rod and soldered to the ends of the levers. They won't get hot, as the heat will dissipate before it could reach them. Screw all the valve bodies into the manifold, and then fit the top nipples and the levers.

The Musical Part

The actual whistles are made exactly as I have described for tube-type locomotive whistles ; the only difference is in the tuning-up. The actual size of the whistle depends on whether you want shrill or deep tones. Thin brass tube of about $\frac{7}{16}$ in. diameter would give medium tones. Make up a whistle with a tube say 4 in. long ; leave the top open, and fit a plunger and rod in it, as shown in the illustration. If you leave out the union, for a kick-off, it can be sounded by lung power ; just blow into the bottom end, and adjust the plunger until it gives the highest-pitched note that you require. Measure how



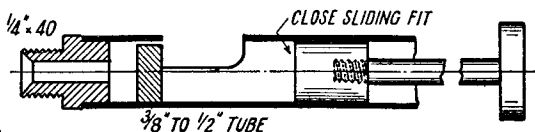
Plan of keyboard

far the plunger is down the tube, and make another whistle with the tube cut down to the measurement indicated, finishing off with the usual cap and union. Now adjust the plunger in the test whistle for a tone lower, and ditto repeat operations until you have sufficient whistles for the desired range of notes. For the deeper tones, a larger diameter tube can be used,

which will reduce the length of the whistle. It may sound a long and tedious job, but once you have found out how much longer the tube should be, to give one note lower on the scale, it is an easy matter to cut the lot into the requisite steps. When all the whistles are made and tuned up, attach each one to a valve, by a swan-necked piece of pipe with two union nuts and cones, as shown in the end view of the whole doings.

How to Operate

To get clear notes, the steam must be hot and perfectly dry, so don't fill the boiler more than halfway up the gauge glass. If hot water is used,



How to tune whistles

it will save the spirit ; and if an adapter is screwed into the front end of the casing, with a pipe and auxiliary blower jet under the chimney, a tyre pump may be used to assist in quick steam raising. When steam is up, open the main steam valve, and the drain cocks on the manifold. I forgot to mention that pipes should be attached to these, to take the condensate water clear of the baseboard. When dry steam issues from the cocks, the little calliope is ready to play, and the cocks may be closed. If you now touch the right keys at the right time, you can hear the "Blue Bells of Scotland," "Ol' Man River," "God Save the Queen"—in fact anything short of Mozart and Beethoven ! As the boiler will make plenty of steam to blow two or three whistles at once, by regulating the blower valve, the keys can be operated in much the same way as those of a piano-accordion, and the resulting chime notes should sound very pretty. The success or failure depends on the making and tuning of the whistles ; if they are O.K. there should be no signs of overtones, blasting, or screeching, but just pleasant music.

Playing Tunes

Children can be taught to play tunes in a very simple manner. Mark the keys of the octave C, D, E, F, G, A, B, C, also those full notes above and below it, in capital letters. Mark the half-tones with small letters, e.g. "c" between C and D, "d" between D and E, and so on. Write the notes of the tune, in fairly large characters, on a paper, and stand it up at the back of the calliope, where the kiddy can read it easily ; a toy easel would be just fine. Space out the letters according to whether the notes are long or short. All the kiddy has to do, is to read the letters, and touch or hold down the corresponding key. Alternatively, mark the keys in old notation characters, or doh-ray-me, as you fancy, and play from ordinary music. Well, there is something out of the ordinary ; and in fancy I can already hear the strains of what the kiddies call "Good King Wenceslosh" whistling over the air on Christmas morning !

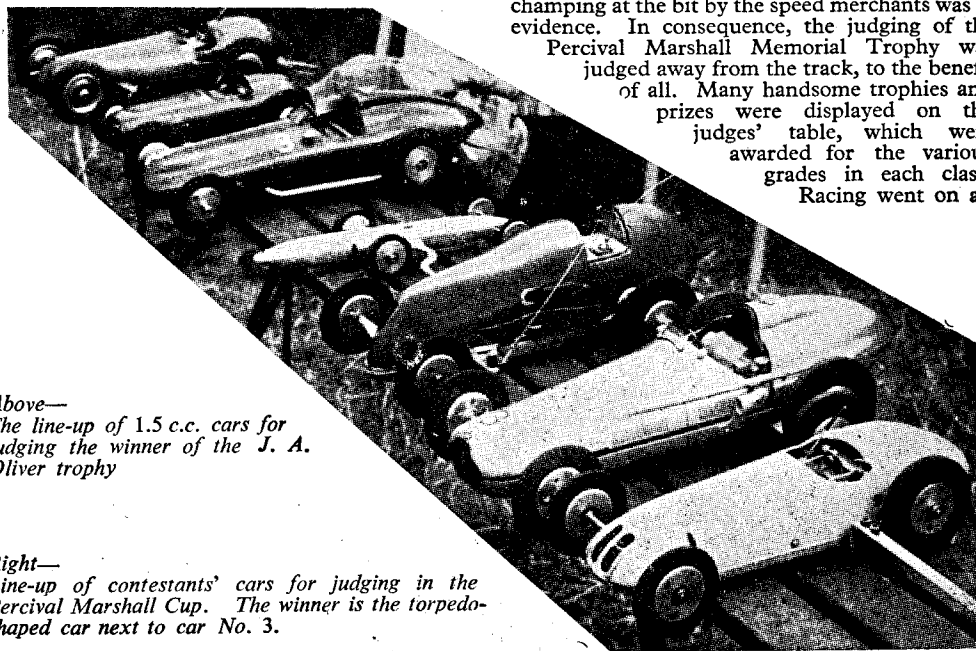
Racing at Nottingham

The Percival Marshall Memorial Trophy



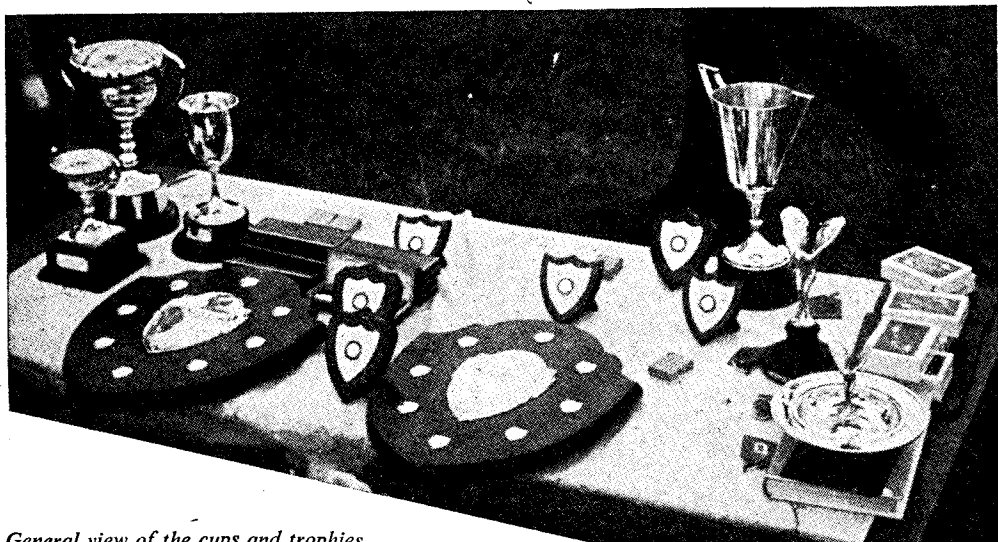
ON a recent Sunday, the combined Nottingham and Derby model race-car open meeting was run against time and with one eye on the weather. Owing to the size of the entry list, competitors were limited to one run in each class.

The first item on the programme was the judging of the J. A. Oliver Scale speed trophy by G. H. Deason, and your reporter. Out of a possible 25 points H. S. Howlett scored 23 points with his Alfa Romeo who tied with W. K. Crow also with an Alfa Romeo, third place going to Howlett's second entry, a Mercedes. Whilst this concurs part of the trophy was being judged, some natural champing at the bit by the speed merchants was in evidence. In consequence, the judging of the Percival Marshall Memorial Trophy was judged away from the track, to the benefit of all. Many handsome trophies and prizes were displayed on the judges' table, which were awarded for the various grades in each class. Racing went on all



Above—
The line-up of 1.5 c.c. cars for judging the winner of the J. A. Oliver trophy

Right—
Line-up of contestants' cars for judging in the Percival Marshall Cup. The winner is the torpedo-shaped car next to car No. 3.



*General view of the cups and trophies.
The Percival Marshall Cup is on the left*

the afternoon until interrupted by showers.

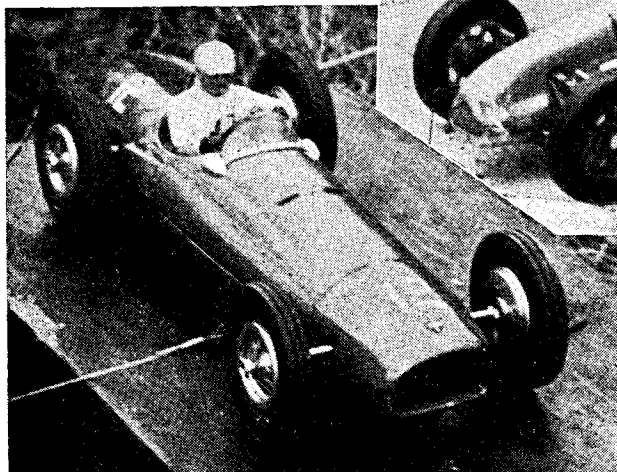
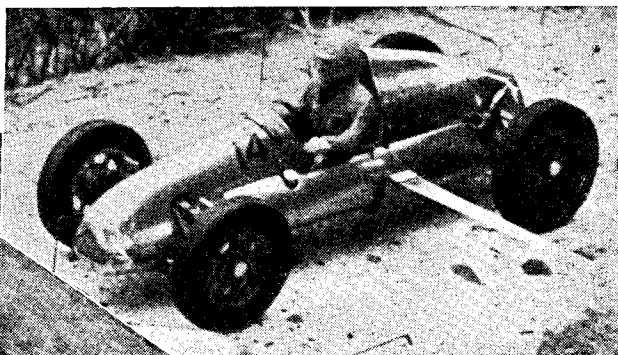
The P.M. Trophy was won by B. Harris with his ingenious and purely functional 2.5 c.c. car, and was the only competitor whose car attained the speed necessary for maximum points (P.M. rules, sections 3 and 4). This, together with 75 points for workmanship, design, own engine design and own castings, put him at the top of seven entries.

The other competitors in order of finishing were as follows :—

2nd.	F. G. Buck	..	10 c.c.	..	70 points
3rd.	H. Pickersgill	..	5 c.c.	..	66 "
4th.	H. S. Howlett	..	10 c.c.	..	62 "
5th.	B. J. Normanshaw	..	10 c.c.	..	48 "
6th.	S. Robinson	..	5 c.c.	..	27 "
7th.	J. Robinson	..	10 c.c.	..	25 "

—C.B.M.

Right—A realistic model of a 500 c.c. Cooper by J. R. Parker (Meteor Club) fitted with a Frog engine



Left—Mr. J. R. Parker's model of the B.R.M. car

THE NATIONAL LOCOMOTIVE RALLY

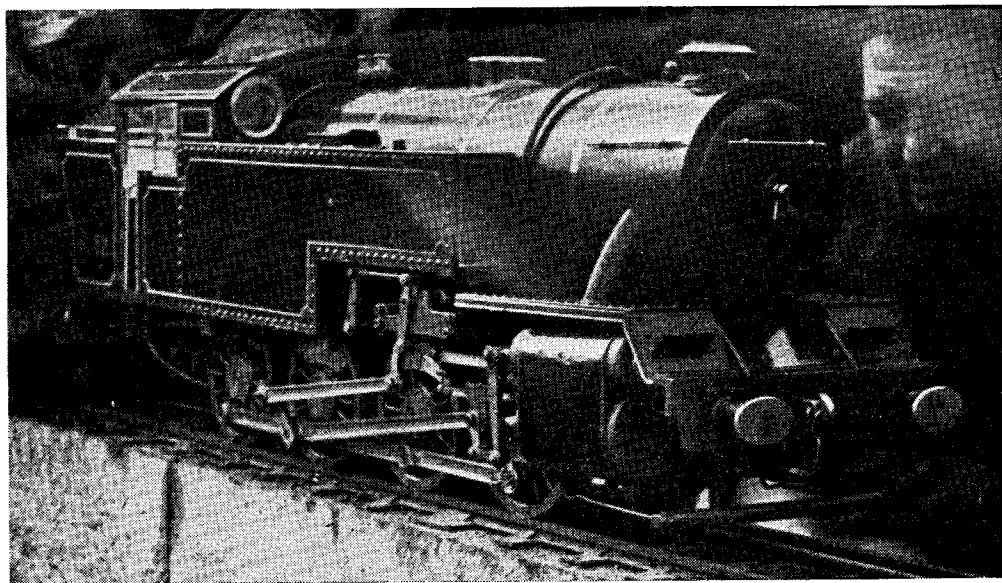
LARGE numbers of "live steam" enthusiasts from all parts of the country, representing about 25 model engineering societies, brought their small steam locomotives many hundreds of miles to attend the 4th National Locomotive Rally, organised by the Birmingham Society of Model Engineers and held at their 3½-in. and 5-in. gauge passenger-carrying track at Campbell Green, Sheldon, Birmingham, during a recent week-end. This fine track, which is 1,056 ft. round (5 laps to the mile), took two years to build, using voluntary club labour, on ground donated by the father of the present vice-president of the Birmingham Society, Mr. J. D. Campbell and, with the true spirit of model engineering, the society holds its annual rally, when the track is available for use by any who wish to run their locomotives. A smaller continuous 2½-in. gauge track placed on ground inside the main circuit is at present under construction.

The visiting model engineers did not believe in wasting a minute of their stay, so that running started early in the day and went on until after dark on Saturday and Sunday. Though we were not there to see it, more than one person told us what a fascinating experience it was to witness running in the dark, with just the sound of steam and valve gear, the only light being the glowing rays from the open firehole door.

Judging in the competition commenced early on Saturday and the results were announced late on Sunday afternoon. In this competition the locomotives are not judged mathematically



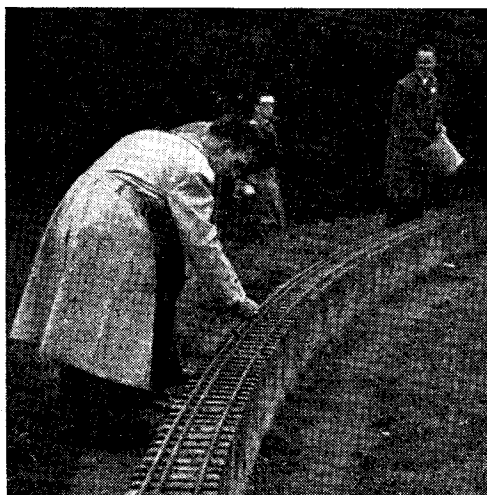
A "Halton" tank going all-out with 30 passengers



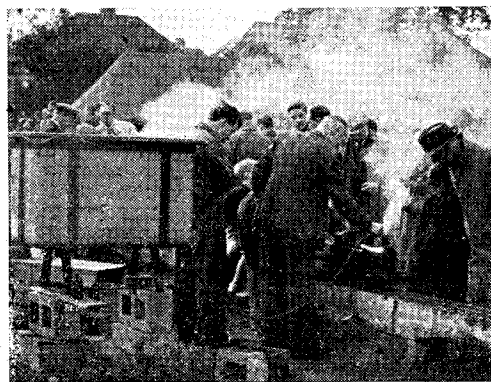
Mr. Cassie, of the Worcester society, ran this massive 5-in. gauge 0-8-0 tank

by scientific performance data, but the results are based on the individual opinions of the three judges, who this year were Messrs. J. H. Doolan, H. G. T. Smith and F. G. W. Biddle. The entries were judged on their general performance (not merely haulage capabilities but also the ability to get away without slipping), fidelity to prototype, workmanship and finish.

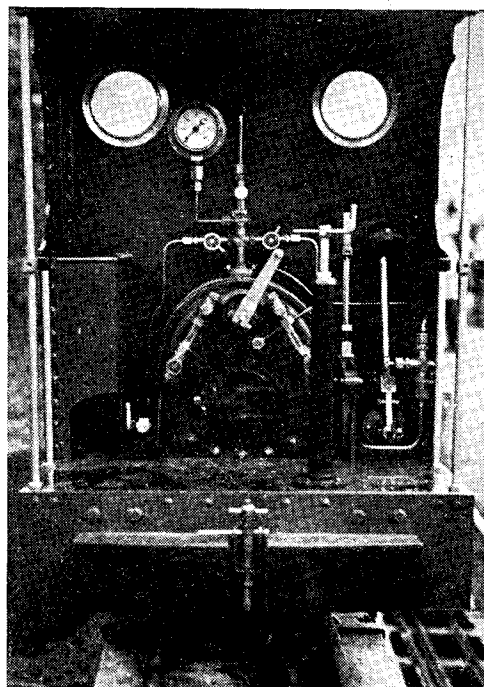
Mr. W. H. Heaton, president of the Birmingham Society presented the cup to Mr. Lynch of the West Riding Small Locomotive Society for his 5-in. gauge L.N.E.R. 2-6-2 "Green Arrow" class locomotive *The Dalesman*, and a medal for the runner up went to Mr. Applewhite of the Burton-on-Trent Society for his 5-in. gauge 0-4-0 saddle tank of Peckett design. Mr. Swaine of the Sunderland Society, who was last year's cup winner, received a small replica of the cup.



The track needed sanding occasionally



There was always a good crowd to watch locomotives "taking water"



Neat cab fittings on Mr. Applewhite's Peckett tank

Many of the members' wives, families and friends came along so that in addition to the more technical activities amongst the "live-steamers," the rally was a pleasant social gathering for all. The primary function of the visitors was to provide a load for the locomotives so that the centre of interest was mainly around the "station" part of the track where the usual scrum for seats ensued among the children every time a train came in. Second only to the station in drawing the crowds was the steam-raising department where the uninitiated watched, usually with obvious curiosity, all the well-known and some lesser-known dodges and subterfuges employed to "get a few pounds on the clock"! When one tired of watching needles creep round gauges, there was a small exhibition of models, mainly locomotives, nearby where we were pleased to see a friend from London, no less than *Lord Mayor*—the 5-in. gauge contractor's locomotive, built by Mr. P. J. Dupen of the Romford Society, which won the Locomotive Championship Cup at the 1950 "M.E." Exhibition.

As we left Campbell Green, dusk was falling and the mist was beginning to form over the field. Most of the cars and lorries had left, carrying locomotives and their owners on the long journey back to Newcastle, Norwich, London or wherever it may be, but there was still a train running round in the half-light while, over by the steam-raising bay, dim figures bent over cabs and peered into fireboxes, preparing to run well into the night. Real enthusiasts, these!

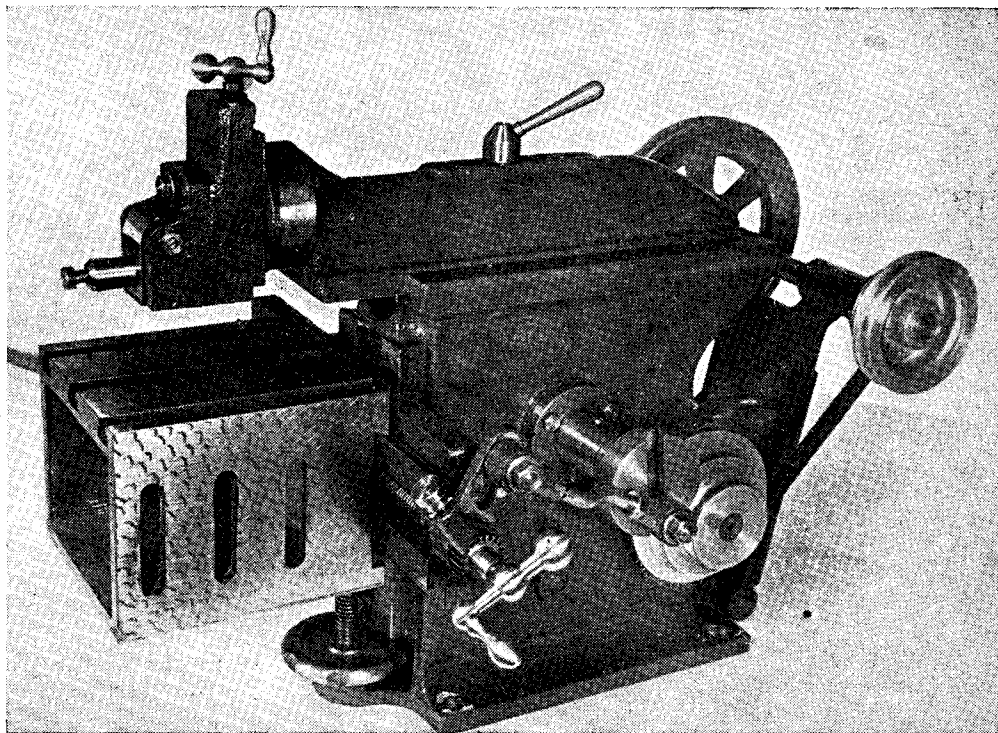
THE "XL" BENCH SHAPING MACHINE

DURING recent years, there has been a marked revival of interest in the use of the shaping machine in model workshops, and several manufacturers have taken pains to cater for this requirement, but most of the machines introduced have been designed for hand operation, and not readily adaptable to power drive, except by drastic alteration or addition. While the usefulness of these machines is not in question, they may be regarded as somewhat out of step with the otherwise universal trend in machine-tool design, where manual power is being rapidly and surely superseded. The introduction of a powered machine, in a size definitely suitable for model engineering requirements, appears to us, therefore, as a step in the right direction, and will, we believe, be welcomed by many of our readers.

The design of this machine, a sample of which has been submitted to us for inspection, follows fairly closely that of the larger power shapers, and it is similarly equipped. It embodies the form of mechanical movement which has been extensively employed for many years in these

machines, namely, an adjustable-throw crank operating, through a sliding die block, a slotted lever pivoted on a stationary shaft at the lower end. The upper end of the lever is connected, by means of a link, to a block adjustably mounted in a slot in the sliding ram. This arrangement provides adjustment of both the stroke and the working position of the ram, and also produces a quick-return motion.

The crank is driven through enclosed spur reduction gearing having a ratio of $4\frac{1}{2}$ to 1, from an external three-step vee pulley. With the standard arrangement of countershaft and a motor running at the normal speed of 1,425 r.p.m., this provides speeds of 35, 70, and 130 strokes per minute. On the outer end of the crankshaft is a slotted disc which drives the ratchet gear of the automatic cross feed, which gives a variable feed from 0.006 in. to 0.018 in. per stroke in either direction. The maximum length of stroke obtainable is 7 in., and maximum cross traverse is 8 in. A work table $4\frac{1}{2}$ in. wide by $6\frac{1}{2}$ in. long (in the direction of ram travel), with a tee-slotted top surface and through-slotted vertical

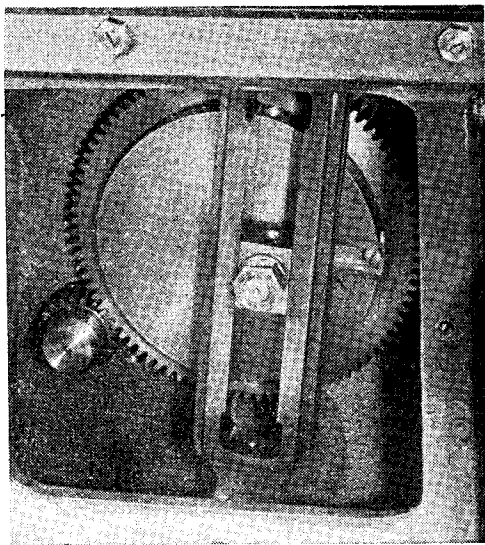


The "XL" bench power shaping machine

sides, is provided, and has a vertical feed giving a maximum distance of 5 in. between ram and table. The tool-head has swivelling adjustment for angular cuts, over a traverse of 2 in., and is provided with a graduated angular scale, the tool holder being also of the swivelling type, with the orthodox "clapper box" for relieving the tool from dragging on the return stroke.

The overall size of the machine is 18 in. high by 17 in. wide and 27 in. long, the size of the base being 10½ in. by 6½ in., and the nett weight is 100 lb. A countershaft and motor platform are provided as an integral part of the machine, and the motor specified is of standard type, ½ h.p. single- or three-phase, supplied separately. It would, of course, be quite practicable to drive the countershaft from an existing lineshaft, or other convenient source of power.

This machine appears to be very well designed and built, robust without being clumsy, and well suited to the kind of work likely to be required in the model or light engineering workshop. The price quoted is well below that of any other power shaper we have so far encountered, and it can be obtained on hire-purchase terms. All enquiries concerning it should be made of Messrs. Corbetts (Lathes), Stanton Hill, nr. Mansfield, Notts.



Pedestal with door removed to show reduction gear and crank motion

PRACTICAL LETTERS

Twist Drill Grinding Jig

DEAR SIR,—I have not read the previous articles by W. D. Arnot on this subject, but in the photographs published in the September 11th issue, I see that he adopts a method of holding the drills that I have had in mind for some time, viz., a proper drill chuck.

I have no jig myself as yet. I have often considered buying one of the manufactured types, but always put it off, because I considered the method of holding the drill, and offering relief to the ground edge, unsatisfactory. Up to the present, all my drill grinding has had to be done by eye; not entirely satisfactory, I agree: a guiding jig will have to be made soon. Even so, being able to grind without a jig is almost a "must"; without a huge jig, I could never grind up a 1-16 in. drill, for instance—this is the biggest I have so far. Since, on the large drills, there is much more metal to grind away, it is not so easy to grind one side down too far: its symmetrical grinding (or lack of) can readily be tested by taking a cut with the drill, and examining the shavings that come from both edges.

Grinding very tiny drills presents a problem of size: I have not found it necessary to use such drills yet, but, without some magnifying apparatus, I don't see how such grinding can be done satisfactorily. For this purpose, a similar jig to W. D. Arnot's, but smaller, would be satisfactory, using a very fine emery wheel. Small drills are dangerous: one mistake, and not only is it not ground symmetrically, but it is all ground away to nothing.

Yours faithfully,

Woking.

R. M. LONGDEN-THURGOOD.

Passenger Hauling on 2½ in. Gauge

DEAR SIR,—I am not concerned with the argument between Mr. Lee and "L.B.S.C." as to which of them has the prior claim to the above feat, but there is one other claim that the latter seems to make that I should like to see cleared up. He says that before his *Ayesha* came into being the few 2½ in. gauge locomotives that did have fire-tube boilers had no superheaters, meaning fire-tube elements; this I question, as I provided one on my No. 3 which was made in 1919 and was described with drawings in *THE MODEL ENGINEER* for June, 1920. "L.B.S.C.'s" own letters in *THE MODEL ENGINEER* establish that *Ayesha* was exhibited as a chassis on Messrs. Bond's stand at the *MODEL ENGINEER* Exhibition of January, 1922, as an example of Mr. Greenly's "all-circular" cylinders applied to a ½ in. scale locomotive, and that it was running early in that year. The arrangement of the superheater was the same as mine—a 7/8 in. element in a ½ in. flue. The firebox crown was also the same—on the centre-line of the barrel.

Actually, I thought I was quite original in providing a fire-tube element in a model locomotive of any size, as no mention of any such thing had appeared in *THE MODEL ENGINEER* other than my article, from January, 1918, up to the article by "L.B.S.C." in January, 1922. My original drawings of this locomotive were made in 1918 and provided for the usual smokebox coil; but as my previous solid-fuel boiler had shown the weakness of this another boiler drawing was made in 1919 incorporating the fire-tube element, and this was fitted from the very first. Although this boiler has a dry back, it has always been a

first-class steam producer, and after our friend had showed us how easy it was to haul live passengers, this No. 3 of mine has always been so used and can run continuously on such work.

This locomotive also had a crosshead pump and long-lap valves, and I venture to say that the mention of this latter item went quite unnoticed in the "M.E." world, which is hardly surprising, seeing that in full-size work only Mr Maunsell, apart from Swindon, seemed to understand what long steam laps meant.

Yours faithfully,

Bexhill-on-Sea.

C. M. KEILLER,
M.I.Mech.E.

Use of Parting Tools

DEAR SIR,—The article, "Notes on Parting Tools," by J. Latta, in a recent issue of THE MODEL ENGINEER, came on the day I just finished a rear toolpost for my ML7 lathe.

Using the toolpost to part through a 1 in. diameter mild-steel bar confirmed all the comments I have read so far on the facile cutting of the parting tool held in this position on the boring table: my main interest, apart from this, has been to consider the reason why parting off from the rear toolpost should be so much easier than from a tool held in a four-way tool holder, on the topslide—which is the case on my lathe.

The tool is set just below centre-height, so that, if "digging in" occurs, the tool will tend to spring down, and away from the work being cut. But consider the differences in mounting the tool on the cross-slide and rear toolpost.

In the latter case, the rear toolpost can be of large dimensions, and very rigidly bolted to the cross-slide, and the bending of the toolpost itself is virtually eliminated; in the former position, however, the tool is held in the four-way holder, which is attached (by the central bolt) to the face of the top-slide, which, in turn, is bolted to the cross-slide. When a parting tool has jammed in this position, I have seen the whole assembly bend towards the work, i.e., pivoting into the work on those edges facing the work: consequently, although the tool may be set below centres, and, on jamming, supposedly move down and away from the work, the additional forwards movement of the topslide and four-way tool holder more than counteracts this, the net result being that the tool still digs in.

I find it hard to believe that on the ML7, the headstock bearings have any effect on parting efficiency at all, since they are very robust.

This is of more than mere academic interest as all users of small lathes will know from experience: apart from making the topslide assembly of more robust design (and these never seem to fail in any other type of cutting) could not lathe manufacturers supply a rear toolpost as standard equipment? Myfords, of course, make a parting off slide, but this is expensive. I will admit that making one presents no difficulty, but I, for one, have been four years considering it!

Yours faithfully,

Woking.

R. M. LONGDEN-THURGOOD.

CLUB ANNOUNCEMENTS

Perranporth and District Model Engineering Society

Our annual exhibition was held this year at the Market Hall, Redruth, from August 30th to September 6th, in conjunction with the Tre-Pol-Pen Shiplovers' Society of Redruth.

Models on show included those made by club members, apprentices at H.M. Dockyard, Devonport, and loans from the general public. The exhibition also displayed stands by The British Tanker Co., British Ropes and the Lifeboat Institution. Music was supplied by Mr. J. F. C. Probert, a member of the P. & D.M.E.S. on his tape recorder.

Over 3,000 people attended, which was far above expectations, and the exhibition was a great success, new members being enrolled by both societies.

Hon. Secretary: W. J. BAKER, St. Piran's Road, Perranporth. Telephone 3243.

The Colchester Society of Model and Experimental Engineers

The following meetings have been arranged and members are asked to support as many of the meetings as possible and make this season our most successful yet.

All meetings at club headquarters, East Bay House, 7.15p.m., unless otherwise indicated, and take place on Fridays.
October 17th, 7.30 p.m. Visit to Ald. Hunwicke's furniture works. A very interesting evening is assured.

October 18th. Track night—"OO" gauge demonstrations by members. Vacancies for spotters, platelayers, wheel-tappers. Experience not essential!

November 14th. Junk box sale. Take the plunge, clear out that scrap and turn it into cash for yourself and the club funds.

November 28th. Clocks.—A talk by Mr. Buckingham, the local horologist.

December 12th. Novelty night. Model engineering in lighter vein. Do not miss this evening's fun.

An interesting programme for the New Year, including a lecture on television, is being prepared.

Secretary: B. DOWNES, "Southernwood," Rowhedge Road, Old Heath, Colchester.

Huddersfield Society of Model Engineers

We have just concluded outdoor activities for this year by entertaining about 40 patients from Storthes Hall hospital. Most of our guests were able to enjoy rides on our 4-in. gauge track and the trains were fully booked up for the afternoon, after which, an excellent tea was provided in our new club-house followed by a film show. The Mayor and Mayoress of Huddersfield joined in the festivities.

Our last "open day" was celebrated by invitations to local model engineering societies, members from nine of which joined us in a very fine afternoon's enjoyment. The power boat sections made an excellent show with a "fleet" of 20 craft of all descriptions.

During the local "Holidays-at-Home," we were asked by the Huddersfield Corporation, to run trains on our portable track in Greenhead Park and during the four weeks of the holidays, upwards of 15,000 "passengers" made journeys—in their imaginations—to places as far apart as Scotland, Blackpool, London, etc. The "highlight" of the last day of the holidays was a grand power boat regatta on the park lake which was watched by over 1,000 spectators.

Hon. Secretary: F. W. L. BOTTOMLEY, 763, Manchester Road, Huddersfield.

Beaufoy Model Engineering Society

Members of the above society meet every Monday, Tuesday, Wednesday and Thursday at the Beaufoy Institute, 39, Black Prince Road, S.E.11. An extensive workshop is available for all members at a nominal charge. Patterns and castings are made on the premises, and a welding and brazing plant is available. Machine tools comprise 20 lathes, four milling machines (horizontal and vertical), three shapers, B. & S. surface grinder, B. & S. horizontal grinder, besides drilling machines and the usual small tools.

New members and beginners are cordially invited to make use of these facilities, and members of other clubs might find some use for our extensive workshops.

Instructor-in-Charge: S. T. HUNT, Beaufoy Institute, 39, Black Prince Road, S.E.11.